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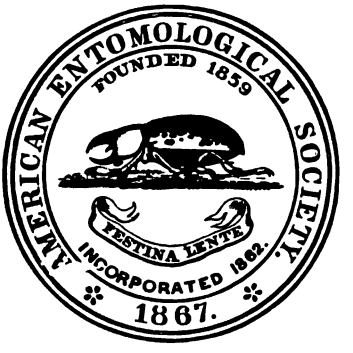

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VOLUME XVII.

The species of HETEROCERUS of Boreal America.

BY GEORGE H. HORN, M. D.

With most collectors Heterocerus does not seem to have been held in much regard. The species have been looked upon as almost inseparable, and the small amount of literature devoted to them has been practically inaccessible to nearly all. To myself they had been equally unattractive until the large material which had accumulated in a quarter of a century required to be dealt with and properly arranged, a task of no small difficulty in a mass of several hundreds from all parts of our country in every style of cabinet preparation.

In a work of this character, after the specimens have been uniformly mounted and prepared for study, the first essential step is the separation of the sexes. This is not a matter of much difficulty, although the males are far less numerous than the females. In the males the head is larger and more prominent, the mandibles more slender and projecting, the labrum longer, and in one group prolonged at middle in a process of varying length according to the species. The clypeus is also retuse to a varying degree, and is especially well marked in the species with a prolonged labrum. The thorax is at least as broad as the elytra, sometimes slightly broader, and not gradually narrowed to the front as in the female.

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In one species, *pusillus*, the males have at the base of the mandibles a lobe prolonged over the labrum. Pl. 1, fig. 16.

The separation of the species, although much less difficult than had been supposed, is not a thoroughly easy task, and the large series before me, while rendering the attempt far more difficult than it would have been with a few score of specimens, has made it possible to determine the limits of variation with greater certainty.

The attempts at a monograph by Kiesenwetter were merely descriptions of species based for the most part on small series, separated without reference to structural characters. Color and sculpture afforded him the means of satisfactory separation, but with large series these are shown to have but little value.

In 1866, Schioedte attempted a division of the genus on characters drawn principally from the antennæ; *Augyles*, one of the subdivisions having but ten joints. The recognition has been shown by deGozis to be extremely difficult and uncertain, and therefore of doubtful value. In 1872, Mulsant and Rey proposed a means of subdivision based on characters of far easier observation and giving apparently more satisfactory results.

It was observed by them that in certain species the elevated curved line on the first ventral segment extended from the front angle by a broad curve toward the middle of the posterior edge of the segment and there terminated, while in others the line continued the curve forward toward the inner edge of the coxa. In the former case the abdominal plates are called open (*plaques abdominales ouvertes*) and in the latter entire (*plaques abdominales entières*). For the species with entire plates the name *Augyles* was erroneously adopted, which deGozis has proposed to change to *Littorimus* (Rev. Ent. 1885, p. 120). In our fauna but one species is known to belong here, *auromicans*.

Recently Dr. Sharp* has observed a character of considerable importance in its application to the grouping of the species. In rather more than half our species there will be observed on the metasternum an elevated line which begins at the middle of the posterior border of the middle coxa, extending obliquely backward joining the suture between the metasternum and its episternum. That this has anything to do with stridulation as suggested by Dr. Sharp seems to me extremely doubtful from its character as well as

* Biol. Cent. Am. vol. i, pt. 2, p. 116.

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from its position in relation to the line of motion of the middle leg. In the following pages this line is designated as the *post-mesocoxal line.*

In two of our species, *gemmatus* and *auromicans*, there will be observed near the base of the epipleuron an elevated oblique line, beginning at the inner epipleural edge posterior to the anterior end of the met-episternum and directed obliquely forward and outward to the humeral angle. Although this character is possessed by but two species, it enables us to separate one of them from another so closely allied as to be almost inseparable without its use.

C. G. Thomson has made a certain use of the number of spinous hairs on the lower edge of the front femur, but without useful result.

While the characters drawn from the markings have, on the whole, but little value, there is one point of considerable utility. In a number of species there exists a pale spot at the middle of the base of each elytron more or less prolonged backward. This is very constant in the species to which it is known to belong, and has as much value here as a similar white spot at the middle of the base of the elytra in certain groups of Cicindela. In fact, the fully developed markings of Heterocerus are decidedly Cicindeloid in type.

In sculpture of the elytra the species vary greatly within specific limits. While in a few species the elytra are not at all, or very rarely, substriate, the larger number of species are distinctly substriate in about half the specimens, the remaining half being either without trace of striæ, or having them but feebly distinct. When the striæ are distinct the fifth is gradually deeper toward the base and forms a basal marginal depression which extends to the middle. The punctuation varies similarly; the large majority of specimens have a close and fine punctuation, scarcely perceptible under the pubescence, but individuals occur with a coarse and conspicuous punctuation. In these latter the elytral markings are usually obliterated. In one species (*Schwarzi*) all the specimens are rather coarsely punctate and the markings remain well defined.

The vestiture of the species consists of a moderately dense, but short, semi-erect pubescence of dark brown color, but paler on the bands or on the spaces where the bands should be. The entire margin is fimbriate with longer hair, more conspicuous on the thorax. In *auromicans*, however, the hairs are short, scale-like and not erect, and the margin is not fimbriate.

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Considerable stress has been laid on the fact as to whether the base of the thorax has a marginal line, but as far as our species are known to me it exists in all, but varies in the sharpness of its definition.

With the structural characters already referred to it is proposed to arrange our species in the following manner:

Stridulating ridge of first ventral segment incomplete, *i. e.*, extending from the front angle in a curved line merely to the posterior border of the segment. **Heterocerus.**

Stridulating ridge of first ventral segment complete, *i. e.*, forming nearly a semicircle from the front angle to the posterior border, then recurving to the inner coxal border..... **Littorimus.**

All our species belong to Heterocerus *proper*, excepting *auromicans*, which belongs to Littorimus.

The species of Heterocerus *proper* may be separated in the following manner:

Subgenus **HETEROCERUS.**

Metasternum without post-mesocoxal line.....2.
Metasternum with post-mesocoxal line..... 5.
2.—Labrum of male narrowed at tip and prolonged in a process of greater or less length.....3.
Labrum of male not prolonged in a process.....4.
3.—Process of male labrum long and narrow..... **gnatho.**
Process of male labrum not longer than half the body of labrum, and not abruptly formed.
Elytra in greater part pale, with indistinct fuscous markings; thorax with sides broadly paler..... **pallidus.**
Elytra piceous, with the usual pale fasciæ more or less developed. **ventralis.**
4.—Mandibles not prominent in male; elytra never with juxta scutellar spot. **undatus.**
Thorax with entire pale border. ..... var. undatus.
Thorax with front angles yellow ..... var. mollinus.
Thorax entirely piceous..... var. fatuus.
5.—Mandibles of male without basal lobe extending over the labrum.....6.
Mandibles of male with basal lobe.....10.
6.—Epipleuræ with oblique elevated line near the base; thorax entirely piceous; elytra without juxta-scutellar spot..... **gemmatus.**
Epipleuræ without oblique elevated line .....7.
7.—Elytra without juxta-scutellar pale spot.....8.
Elytra with juxta-scutellar pale spot.....9.
8.—Large species; legs more or less piceous; elytra usually substriate, the pale fasciæ much broken and never broad..... **brunneus.**
Smaller species; legs entirely pale; elytral markings well defined and broad, usually entire, surface not substriate..... **Schwarzi.**

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9.—General color of upper surface brownish, often quite pale in the small specimens, thorax merely slightly darker at middle, rarely entirely brown; mandibles of male with a basal lobe on outer side more or less angulate. **collaris.**

General color piceous, thorax piceous, often sharply bordered with pale; mandibles of male not prominent at base; elytral markings tending to form vittæ..... **tristis.**

10.—General color pale, often entirely so or with a broad thoracic space and an equally broad sutural space on the elytra fuscous..... **pusillus.**

Subgenus LITTORIMUS.

Metasternum with post-coxal line; epipleuræ with oblique elevated line near the base; stridulating line of first ventral segment entire..... **auromicans.**

H. gnatho Lec.—Oblong, moderately convex, piceous, clothed with short, semi-erect brownish hairs, the entire margin fimbriate with longer hairs, elytra with the usual sinuous bands more or less interrupted and with a juxta-scutellar basal spot. Antennæ ferruginous. Head densely, finely punctured and opaque. Thorax fully twice as wide as long, sides moderately arcuate, narrower in front in ♀, base arcuate, oblique each side and with a distinct marginal line, disc moderately convex, densely punctulate and with longer pubescence (as also the head) than on the elytra; color entirely piceous, the anterior angles often yellow. Elytra nearly parallel, disc vaguely substriate, surface densely punctulate, a little more coarsely than on the thorax, color piceous, with the usual sinuous reddish yellow bands more or less interrupted, a recurrent lunule near the apex, a spot more or less triangular at basal margin on each side of scutellum. Epipleuræ yellow. Body beneath piceous, more shining and less pubescent than above, anterior angles of thorax, tip of prosternal lobe and sides and apex of abdomen yellow; abdomen, densely, punctulate. Femora yellow, tibiæ and tarsi piceous. Length .16—.22 inch.; 4—5.5 mm. Pl. 1, fig. 1.

Male.—Labrum broader than long, the middle third of the apex abruptly prolonged in a process as long as the body of labrum, the tip emarginate, the upper side carinate. Mandibles slender and long, the post-apical teeth small, without trace of basal lobe on the outer side. Front slightly retuse. Thorax a little broader than the elytra, sides arcuate, not narrower to the front.

Female.—Labrum broader than long, oval, the middle of apex with two short, obtuse teeth and on each side a slight sinuation. Mandibles shorter and broader than in the male and with the teeth well marked. Front continuous with the labrum. Thorax not broader than the elytra, distinctly narrowed to the front.

Variations.—The sinuous bands may begin at the lateral margin independently, but many specimens occur with an entire yellow border from base to apex. The bands are variably interrupted, but there is no great difference in this respect. In immature specimens the elytra are nearly as pale as in *pallidus;* such formed the types of the species.

The male will be easily known by the form of the labrum from any species in our fauna. The female having the juxta-scutellar

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spot could only be mistaken (in description) for *pallidus* or *undatus*, both of which have the sides of thorax broadly paler, or for *collaris* and *tristis*, both of which have the meso-coxal line.

After an examination of the types of *gnatho* and *labratus* (labiatus ||) it has been found that the two are absolutely identical, except as to color. The types of *gnatho* are merely pale specimens.

Occurs in the southern portion of California and the adjacent regions of Arizona, probably extending also into Mexico.

H. pallidus Say.—Oblong, feebly convex, piceous, the elytra in great part pale luteous, sides of thorax broadly pale, surface clothed with short, semi-erect pubescence, fulvous on the paler parts, brownish elsewhere, entire margin fimbriate with longer hairs. Antennæ pale testaceous. Head dark brown, densely punctulate. Thorax fully twice as wide as long, wider in the male, base arcuate, slightly oblique each side with a distinct marginal line, disc moderately convex, densely finely punctulate, color brown or piceous, the sides broadly yellowish. Elytra parallel ♀, or slightly narrower behind ♂, disc faintly striate, surface densely finely punctulate, general color pale luteous, with indistinct brownish markings. Epipleuræ pale. Body beneath piceous, the sides of prothorax and abdomen, the entire last ventral segment pale. Abdomen closely, but very minutely punctulate. Legs entirely pale yellow. Length .17—.22 inch.; 4.5—5.5 mm. Pl. 1, fig. 2.

Male.—Labrum broader than long, the middle third of apical margin prolonged in a process about one-third the length of the body of labrum and emarginate at tip. Mandibles slender, moderately long, the teeth small and near the apex. Front slightly retuse. Thorax more than twice as wide as long, sides regularly arcuate, not narrowed in front.

Female.—Labrum oval, narrowed in front, a slight emargination at middle. Mandibles shorter and stouter than in the male, the teeth more evident. Thorax twice as wide as long, sides arcuate and distinctly narrowed in front.

Variations.—The thorax may be almost entirely piceous. The elytra vary also in the extent of the pallid color, which is really only the expansion of the usual sinuous bands of the other species, so that merely indistinct fuscous markings appear. The underside of body may vary from the described form which is in great part piceous, to entirely pale, as in the specimens described by Say.

The male is readily known. The female, when small, might be mistaken for *collaris*, but there is no meso-coxal line in *pallidus*. The pale elytra and entirely yellow legs will distinguish either sex from any of the species in which the male has the prolonged labrum.

Occurs in western Kansas (Popenoe) to El Paso, Texas and Ariz.

H. ventralis Mels.—Oblong, feebly convex, piceous, clothed with short, semi-erect fulvous or brownish pubescence, the entire margin fimbriate with longer hair, anterior angles of thorax yellow, sometimes the entire side; elytra

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with the usual sinuous bands always interrupted and sometimes indistinct, rarely a basal spot. Antennæ piceous, the basal joint paler. Head densely finely punctulate. Thorax twice as wide as long, sides arcuate, base arcuate at middle, oblique each side and with a distinct marginal line, disc moderately convex, densely finely punctulate. Elytra parallel in both sexes, substriate, closely punctulate, sinuous bands interrupted on the disc and not united at the margin by a pale border. Epipleuræ piceous. Body beneath piceous, more shining than above, finely closely punctulate, anterior angles of prothorax, tip of prosternal lobe, sides and tip of abdomen narrowly yellow. Femora reddish yellow, piceous at base, tibiæ piceous, tarsi pale. Length .24 inch.; 6 mm. Pl. 1, figs. 3-4.

Male.—Labrum obliquely sinuately narrowed at apex, prolonged at middle in a process about one-half as long as the body of labrum, feebly emarginate at tip. Mandibles prolonged and slender, the post-apical teeth very indistinct; front retuse. Thorax rather more than twice as wide as long and slightly wider than the elytra, sides regularly arcuate, not narrowed in front.

Female.—Labrum broader than long, sinuate each side of apex, slightly prolonged at middle and with a slight emargination. Mandibles shorter and stouter than in the male, the teeth distinct. Thorax distinctly narrowed in front, not broader than the elytra.

Variations.—Beyond the varying degree of interruption of the sinuous bands no differences have been observed beyond those given in the description.

From all the species which precede this may be known by the absence of the juxta-scutellar yellow spot. The females bear a very close resemblance to *gemmatus* so common in the Pacific region, but the absence of a post-mesocoxal line in *ventralis* will enable the two to be separated. It is more difficult by description alone to separate the females of this and *undatus*, but the labrum of the latter is not sinuate each side and the emargination broader.

Occurs in Pennsylvania, New York, Ohio.

H. undatus Mels.—Oblong, moderately convex, piceous or brown, thorax variable, elytra with the usual sinuous bands more or less interrupted, a subapical lunule, but no basal spot, surface clothed with brownish pubescence, the entire margin distinctly fimbriate. Antennæ piceous. Head piceous, densely punctulate. Thorax twice as wide as long, sides arcuate, base arcuate, distinctly sinuate at the sides, the marginal line distinct, disc densely punctulate, sometimes entirely piceous, or with the front angles yellow, or the sides narrowly yellow. Elytra oblong, parallel in both sexes, usually substriate, often not so, the surface densely punctulate, piceous or brown, with the usual sinuous, more or less interrupted bands, which are sometimes united at the margin by an entire pale border; surface densely punctulate, the punctures varying in degree. Epipleuræ usually piceous, rarely either entirely pale, or pale at base only. Body beneath piceous, the front angle of prothorax sometimes, the sides of abdomen narrowly yellow. Abdomen densely finely punctulate. Femora yellowish or brown, tibiæ piceous. Length .16—.18 inch.; 4—4.5 mm. Pl. 1, fig. 6.

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Male.—Labrum slightly broader than long, arcuately narrowed to the front, the apex emarginate at middle. Mandibles slightly prominent, the incisure of the upper margin rather deep. Front distinctly retuse. Thorax a little wider than the elytra, slightly narrowed in front.

Female.—Labrum shorter and broader than in the male, rather broadly emarginate truncate at apex. Mandibles not prominent, the incisure of the upper edge deep, but the lobular projection exterior to it less prominent. Thorax not wider than the elytra, very distinctly narrowed in front.

Variations.—The wide distribution of this species is probably the cause of its variability from the climatic influences to which it is subjected. In order that the variations may be understood the following sketch has been prepared:

Thorax entirely piceous.
  Elytral markings almost entirely obliterated..... (— — —)
  Elytral markings more or less distinct.
    Elytra substriate .... **substriatus.**
    Elytra not substriate..... .... **miser.**
Thorax with anterior angles yellow to a varying extent backwards.
  mollinus = fatuus.
Thorax with sides narrowly pale from base to apex. Legs paler than in the preceding forms..... **undatus** Mels.

(— — —) Piceous black above and beneath including the legs, the front angle of prothorax and side of front ventral segment pale. Elytral markings almost entirely obliterated, their position indicated by paler gray hair; punctuation of elytra rather coarse and conspicuous.

substriatus Kies.—Color piceous, the elytral bands fairly distinct, the punctuation usual. Beneath piceous, the front angle of the prothorax and sides of abdomen paler. Femora in great part brownish or reddish yellow, tibiæ piceous.

The substriate character of this form, on which Kiesenwetter lays some stress, has no value whatever, as in all the species forms occur either substriate or not.

It is barely possible that the Kiesenwetter type of *substriatus* may be really a synonym of *brunneus*, as the specimens of this are more decidedly and uniformly striate than elsewhere.

miser Kies. is a small form of the above with similar color and sculpture, but without elytral striæ.

mollinus Kies.—Piceous or brown, the front angles of thorax yellow sometimes to the middle. Elytral markings distinct. Body beneath similar to *substriatus*. Femora rufotestaceous, tibiæ brown or piceous.

fatuus Kies. is merely a smaller *mollinus*.

undatus Mels.—Piceous or brown, sides of thorax from base to apex bordered with yellow. Elytral markings always quite distinctly marked. Body beneath with a broader border of pale. Legs sometimes entirely pale, or with the tibiæ alone fuscous.

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The larger females of this form resemble those females of *ventralis* in which the sides of the thorax are more or less pale, but in this species there is never a juxta-scutellar spot, on the elytra and in both sexes the labrum is rather differently formed.

Occurs from Canada and the New England States westward to Wyoming and from these points southward in the entire region east of the Rocky Mountains.

H. gemmatus n. sp.—Oblong, moderately convex, piceous black, clothed with the usual gray or fulvous pubescence, with longer hairs at the margin, elytra with the usual sinuous bands each nearly always broken into three oval spots. Antennæ piceous, the basal joint usually paler. Head densely punctulate. Thorax twice as wide as long, sides arcuate, base arcuate, and at the sides oblique, marginal line distinct, entire; disc moderately convex, densely punctulate, color entirely piceous when mature. Elytra parallel ♀, or slightly narrower posteriorly ♂, disc variably substriate, sometimes indistinctly, as often very evidently, surface densely punctulate, color piceous, the sinuous bands orange yellow, often very indistinct, each usually divided into three oval spots, a marginal spot near apex, another slightly in front of this. Epipleuræ piceous, an oblique elevated line near the base; metasternum with post-mesocoxal oblique line. Body beneath piceous black, more shining than the upper surface, the entire reflexed side of pronotum, tip of prosternal lobe, the sides and apex of abdomen narrowly, yellow. Abdomen densely, finely punctulate. Legs piceous, tarsi alone pale. Length .13—.25 inch.; 3.25—6.5 mm. Pl. 1, fig. 5.

Male.—Labrum broader than long, slightly narrowed in front, apical margin slightly emarginate at middle and on each side sinuate. Mandibles moderately long, the teeth small. Front slightly retuse behind the labrum. Thorax distinctly wider than the elytra, not narrowed in front. Elytra slightly narrowed from the humeri posteriorly.

Female.—Labrum scarcely differing from the male, except that it is a little shorter and the sinuations in front less distinct. Mandibles shorter and stouter, the teeth very well developed. Thorax slightly narrower than the elytra, narrowed in front. Elytra parallel.

Variations.—As will be seen by the measurement this species varies considerably in size as well as in the distinctness of the striæ. The markings vary greatly. In the greater number of specimens, the bands are completely broken up, in many, however, they are as in the form figured. Immature specimens have not only the bands perfect, but the entire side has a pale border and the epipleuræ also pale. In the specimens from the northern regions the vestiture is a distinct pubescence, while in those from the south (Los Angeles, etc.) the vestiture approaches that of *auromicans*.

In this species the thorax of the male is more convex, and the appearance more massive than usual. The differences between it and *ventralis* have already been referred to. Some small and slightly

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immature specimens are before me with the bands quite well marked, these by their size and appearance resemble to a deceptive extent some of the forms of our eastern *undatus* (var. *mollinus*), but the presence of the mesocoxal and epipleural lines will at once separate the present species.

Occurs in the region from Washington southward through California to Arizona, also in western Nevada.

H. brunneus Mels.—Oblong, moderately convex, piceous, slightly shining, surface with the usual short, semi erect pubescence, margin fimbriate with slightly longer hairs, elytra with the usual sinuous fasciæ, more or less interrupted and in some specimens scarcely distinct. Antennæ piceous, two basal joints somewhat paler. Head densely finely punctured, subopaque. Thorax fully twice as wide as long, sides arcuate, slightly narrowed in front in ♀, base feebly arcuate at middle, obliquely sinuate each side, the basal marginal line entire, disc moderately convex, extremely finely and densely punctulate, color entirely piceous, rarely with the front angles slightly yellowish. Elytra parallel, disc nearly always substriate, the punctuation variable, usually fine and dense, less commonly quite coarse and conspicuous, markings almost exactly as in *mollinus*, and at times almost entirely obliterated. Epipleuræ without basal oblique line. Body beneath, in mature specimens, entirely piceous. Metasternum with distinct post-mesocoxal line. Legs usually entirely piceous, but variable from maturity. Length .12—.16 inch.; 3—4 mm.

Male.—Labrum much broader than long, nearly semi-circular, apex entire. Mandibles not prominent; clypeus slightly convex. Thorax as broad as the elytra, very slightly narrowed in front.

Female.—Labrum twice as wide as long, broadly, but not deeply emarginate in front. Thorax distinctly narrower than the elytra and more narrowed in front than the male.

Variations.—As in all the other species, this one varies in the extent of the sinuous markings of the elytra, being at times complete, but usually broken into spots. In the vast majority the thorax is entirely piceous, but in some the front angles are paler. None have been seen with the entire border pale. The elytral sculpture varies in the punctuation and striation. In some the punctures are quite coarse and conspicuous, or again very fine. On the whole the specimens are more distinctly striate than in any other species, although this, too, is variable. The legs vary in color. In those specimens the markings distinct and entire and which have very often the bands united along the border, the legs when seen from beneath are almost entirely yellow, the upperside of the tibiæ is black. In the darker and indistinctly marked specimens, which are the most common, the legs are either entirely piceous or the front femora slightly yellow.

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This species greatly resembles the smaller forms of *gemmatus*, and also *mollinus*, the latter more especially. With the former it agrees in having the post-mesocoxal line and differs in the absence of the epipleural line. From the latter, which has no post-mesocoxal line, it is easily known.

This species is widely distributed. California, Oregon, Nevada, Wyoming, Canada, Illinois, Nova Scotia, Nebraska, Louisiana and District of Columbia.

H. Schwarzi n. sp.—Oblong, convex, piceous, clothed with the usual semi-erect brownish pubescence, the margins fimbriate with longer hairs, elytra with the usual sinuous bands, which are usually broad, often broken into spots, these also large. Antennæ brownish, paler at base. Head densely punctate, clypeus emarginate. Thorax rather more than twice as wide as long, sides arcuate, narrowed in front, more distinctly so in the female, base distinctly sinuate each side, the marginal line well marked, disc convex, closely finely punctured; color entirely piceous. Elytra parallel, disc very vaguely substriate at middle near the base, the punctuation coarse and deep, closely, but not densely placed; color piceous brown, with the usual yellowish sinuous bands, which are often interrupted. Epipleuræ pale. Body beneath brownish, paler than the upper surface, sometimes almost entirely testaceous. Metasternum with distinct post-mesocoxal line. Abdomen closely punctulate, not densely pubescent. Legs entirely pale. Length .12 inch.; 3 mm. Pl. 1, fig. 10.

Male.—Labrum more than twice as wide as long, with a slight broad emargination at apex. Mandibles not prominent, front very slightly retuse. Thorax more broadly arcuate than in the female, less narrowed in front.

Female.—Labrum and mandibles scarcely differing from the male. Front not retuse, clypeus more distinctly emarginate. Thorax very distinctly narrowed in front.

Variations.—The only variation observed is in color, the markings being sometimes continuous, often broken into spots. The underside varies from brown to yellow.

This species is very closely related to *collaris* in its small varieties, and the two are difficult to separate by any absolute character. The present is more robust and convex, the color above, especially the thorax, in great part piceous brown, the elytra always with faint traces of striæ. In none of the specimens of *collaris* have I observed the thorax approaching the dark color of the present species; it is at most pale brown with broadly paler sides.

Occurs in Burnet County, Texas, from Mr. E. A. Schwarz; also in the Lake Superior region (cab. LeConte) and near Allegheny, Pa. (Dr. Hamilton)

H. collaris Kies.—Oblong, moderately convex, fuscous or piceous, clothed in the usual manner with brownish hair, sides of thorax pale, elytra with the

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usual sinuous bands and a juxta-scutellar basal spot yellow. Antennæ brown, the basal joints pale. Head piceous, densely punctulate. Thorax twice as wide as long, sides arcuate, base arcuate, slightly oblique each side, the marginal line distinct, disc moderately convex, densely punctulate, color piceous or brown, the sides indefinitely paler. Elytra parallel, more or less substriate, densely punctulate, color brown to piceous, the usual two sinuous bands more or less interrupted and often indistinct, a recurrent lunule near the apex and a juxta-scutellar spot. Epipleuræ pale. Body beneath piceous, the side of the prothorax, tip of prosternum, sides and apex of abdomen indefinitely, yellow. Metasternum with distinct mesocoxal line curved with the convexity anteriorly. Abdomen densely finely punctulate. Legs entirely yellow. Length .10—.18 inch.; 2.5—4.5 mm. Pl. 1, figs. 7–8.

Male.—Labrum broader than long, arcuately narrowed to apex and with a slight emargination at middle. Mandibles moderately prominent, the teeth small, at base on outer side a prominent lobe which forms a more or less distinct angulation at its front end. Front oblique, not retuse. Thorax as wide as the elytra, slightly narrowed in front.

Female.—Labrum similar in form to the male, but not as narrow in front. Mandibles more robust, the entire basal lobe arcuate, not forming a prominent angle in front. Thorax a little narrower than the elytra, narrowed in front.

Variations.—The general color has already been referred to. In the darker forms the sides of thorax are not completely bordered with yellow. The elytra are often without any trace of striæ and again very plainly striate. The sinuous bands in their extent and interruption vary here as in every other species.

Along the Gulf region from Florida to Texas, and even Arizona, a form occurs which is nearly as small as *pusillus*, and without some care would be mistaken for that. It is quite pale in color and the sinuous bands are so extended as to leave but a small region along the suture somewhat darker in color. The contrast between the larger forms of *collaris* and these small forms is so pronounced that with limited material one would be justified in giving it a distinct name, but with a series of one hundred and twenty specimens before me with all gradations of size in color I feel satisfied that they are all one variable species.

The form of *collaris* is rather more slender than in the species of its size. The only other species which has at the same time a juxta-scutellar spot and the mesocoxal line is *tristis*, which has a broader form, piceous tibiæ, and the mandibles have not in either sex a prominent lobe on either side of base.

This species has a wide distribution. From Allegheny, Pa. (Hamilton), Ohio (Dury), Illinois (Strumberg), Florida (Schwarz), Texas (Schaupp), New Mexico (Wickham), Arizona (Morrison),

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southern California (Xantus). The specimens from the southwestern regions are generally larger.

H. tristis Mann.—Oblong, subdepressed, piceous, rather sparsely clothed with the usual short brownish pubescence, longer on the head and thorax, sides of thorax indistinctly paler, more broadly in front, lateral margin entirely but narrowly pale, the usual sinuous bands much broken into short longitudinal lines, the juxta-scutellar spot forming a rather long stripe, on each side of this one third from base a short stripe, more posteriorly a pair of lines the inner oblique, the outer longitudinal, behind these two more, both slightly oblique, sometimes united. Antennæ piceous. Head piceous, densely punctulate. Thorax rather more than twice as wide as long, sides arcuate, base arcuate, slightly oblique each side, marginal line distinct, color piceous, with an indistinct yellow border, wider in front. Elytra parallel, vaguely substriate, punctuation close, variable in coarseness; epipleuræ pale. Body beneath piceous, sides of prothorax and abdomen narrowly, yellow. Metasternum with distinct mesocoxal line. Abdomen closely punctulate. Femora and tarsi pale, tibiæ piceous. Length .12—.18 inch.; 3—4.5 mm. Pl. 1, fig. 9.

Male.—Labrum broader than long, arcuately narrowed to the tip, apex emarginate at middle. Mandibles scarcely prominent, with scarcely evident basal lobe on outer side. Front slightly retuse. Thorax as wide as the elytra, arcuately narrowed to the front.

Female.—Labrum shorter and more obtuse in front than in male; mandibles stouter. Front not retuse. Thorax a little narrower than the elytra and more narrowed in front.

Variations.—For a species in which the bands are so much broken as to lose almost all trace of their sinuous relationship, the markings are remarkably perminent, becoming merely a little broader and occasionally slightly confluent.

In the remarks on the differential characters of the preceding species, those with which this might be confounded have been referred to and need not be repeated here.

In distribution this species seems essentially northern. Massachusetts (Blanchard), New York, Philadelphia (Liebeck), Canada, Wisconsin, Dacota, Nevada and Sitkha (Motschulsky).

H. pusillus Say.—Oblong, moderately convex, yellowish testaceous to pale fuscous, either entirely uniform in color, or with a broad darker band through the centre of the upperside, surface with short yellowish pubescence, the margin slightly fimbriate. Antennæ testaceous. Head fuscous, densely punctulate. Thorax twice as wide as long, sides arcuate, base arcuate at middle, distinctly sinuate each side with a distinct marginal line, disc convex, closely, but extremely minutely punctulate, color either entirely pale or with a broad central space darker. Elytra parallel not substriate, closely but indistinctly punctulate, color either uniform testaceous varying to a broad median space darker in color, not reaching the apex. Epipleuræ pale. Body beneath a little

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darker in color than above, abdomen closely but indistinctly punctulate. Metasternum with mesocoxal line, which is, however, indistinct. Legs entirely pale. Length .08—.10 inch.; 2—2.5 mm. Pl. 1, fig. 12.

Male.—Labrum broader than long, narrowed to apex, the tip entire. Mandibles not prominent, but with a basal lobe prolonged from the inner side over the base of labrum in front of the clypeus. Thorax as wide as the elytra, sides arcuate, not narrowed in front.

Female.—Labrum similar to that of male, but broadly truncate at apex. Mandibles without basal lobe. Thorax distinctly narrowed in front.

Variations.—Many specimens are entirely testaceous in color with the head alone darker, these are *luteolus* Lec. and when slightly ferruginous are typical of *pusillus* Say. By far the larger number have the greater portion of the disc of thorax pale fuscous, the margins broadly pale and with an equally broad fuscous space on the elytra not reaching the apex, these are *limbatus* Kies. Rarely the darker space on the elytra is narrowed to a vitta on each elytron.

The only species with which this might be confused is *collaris*, in its very small form. The males are readily known. The females are difficult to separate in description, but it will be observed that the markings of the elytra in *collaris* although indistinct, are of the sinuous band type.

Occurs from Allegheny, Pa. (Hamilton), westwardly to Illinois, thence to Texas, Arizona, southern California and northern Mexico.

H. auromicans Kies.—Oblong, convex, more obtuse at the extremities than usual, surface sparsely clothed with golden, short, scale-like, recumbent hairs, the margin not fimbriate, color piceous, sides and median stripe of thorax pale, elytra with sides, two sinuous vittæ and short subapical lunule yellow. Antennæ pale brown. Head piceous, densely punctulate. Thorax twice as wide as long, sides feebly arcuate posteriorly, more strongly in front, base arcuate, slightly oblique each side, the marginal line very distinct, hind angles more defined than usual, surface rather more coarsely and less closely punctate than usual in the genus; color piceous, the sides and a median stripe paler, these of variable width. Elytra parallel, substriate, closely punctulate, color piceous, the entire lateral margin narrowly yellow, two sinuous bands, the anterior very oblique, the posterior more transverse, near apex a rudiment of a recurrent lunule. Epipleuræ pale, an oblique elevated line near the base. Body beneath piceous black, the prothorax in great part yellow, abdomen, in feebly mature specimens, piceous the tip of the last segment and a spot on each side of the two preceding yellow. Metasternum with distinct mesocoxal line. Stridulating ridge of first ventral segment entire. Femora and tarsi rufotestaceous, tibiæ piceous. Length .12—.16 inch.; 3—4 mm. Pl. 1, fig. 11.

Male.—Labrum transverse, narrowed in front, apex emarginato-truncate Mandibles slightly prominent, the teeth small. Clypeus slightly emarginate, front slightly retuse. Thorax more than twice as wide as long, slightly wider than the elytra, sides suddenly arcuate at the front and abruptly narrowed to the head.

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Female.—Labrum and mandibles shorter than in the male. Thorax twice as wide as long, not wider than the elytra, sides regularly arcuately narrowing from base to apex.

Variations.—The only variations are in color. In one female the thorax has no median pale stripe. The elytral bands are always continuous, but vary in width. Changes in color from less maturity can easily be accounted for.

An easily known species from the vestiture and the absence of marginal ciliæ. On the intervals of the elytra there are distantly placed longer and more prominent golden hairs. In glancing over the species before me it seems hardly possible to mistake this species for any other. It and *gemmatus* are remarkable in having an elevated oblique line on the epipleuræ near the base.

This species is remarkable in being the only one in our fauna in which the stridulating ridge of the first ventral is entire. The ridge begins in the usual manner at the outer front angle of the first segments curves obliquely backward toward the posterior border then bends rather abruptly forward and extends obliquely to the point of articulation of the trochanter with the coxal angle.

Occurs from Canada through the Middle States to Texas and as far west as Michigan, Wisconsin and Kansas.

Before concluding this paper it is proper to indicate the material used:

The LeConte cabinet has been carefully studied on the occasion of several visits. It contains the types of his own species besides those of Melsheimer. In addition there are several which have been sent by Schaum, and which formed part of the material used by Kiesenwetter, viz.: *collaris, limbatus, fatuus, mollinus, cuniculus* and *auromicans.*

Mr. H. Ulke, of Washington, with his usual kindness, has loaned me his entire and very full series.

Mr. Samuel Henshaw has added for study several hundred from all parts of the country.

Mr. E. A. Schwarz has also loaned interesting material and added one new species to the list.

Mr. M. L. Linell a very useful series collected near N. Y. City.

Of the species studied *H. Schwarzi* has been represented by thirteen specimens, the remaining species have been studied from more than twenty-five examples, while in *undatus, collaris, limbatus* and *gemmatus,* hundreds of each have been before me.

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While in all parts of the coleopterous series an abundant series is useful, in Heterocerus a very large series is absolutely necessary, and the more specimens examined the greater the difficulty in defining the species and the greater necessity for the use of judgment in placing specimens. About half of the species are separable by structural characters of a positive nature, while others, especially *collaris* and *undatus* are extremely difficult to define.

HETEROCERUS Bosc.

H. gnatho Lec., New Species, 1863, p. 74.
labratus Lec., List Col. N. A. p. 35; *labiatus* (||) Lec., New Species, 1863, p. 75, err. typ.
H. pallidus Say, Journ. Acad. iii, p. 199; edit. Lec. ii, p. 127.
H. ventralis Mels., Proc. Acad. ii. p. 98.
labiatus Kies., Revis. Linn. Ent. v, 1851, p. 282.
H. undatus Mels., Proc. Acad. ii, p. 98; Kies., loc. cit. p. 293.
var. *cuniculus* Kies., loc. cit. p. 283.
var. *substriatus* Kies., loc. cit p. 290.
miser Kies., loc. cit. p. 290.
var. *mollinus* Kies., loc. cit. p. 289.
fatuus Kies., loc. cit. p. 292.
H. gemmatus n. sp. (idem LeConte in cab.)
H. brunneus Mels. Proc. Acad. ii, p. 91.
flavipes Lec., mss.
H. Schwarzi n. sp.
H. collaris Kies., loc. cit. p. 292.
ornatulus and *fuscipes* Lec., mss.
vilis Sharp, Biol. Cent. Am. i, 2, p. 773.
H. tristis Mann., Bull. Mosc. 1853, iii, p. 218.
H. pusillus Say, Journ. Acad. iii, p. 200; edit. Lec. ii, p. 128.
limbatus Kies. Germ. Zeit. iv, 1843, p. 215, pl. 3, fig. 13.
luteolus Lec., New Species, p. 75.
americanus Sharp, Biol. Cent. Am. i, 2, p. 772.
H. auromicans Kies., loc. cit. p. 287.

Among the species described by Dr. Sharp, from Mexico, *velutinus* should be compared with *gnatho* Lec., and *mexicanus* with *collaris*.

EXPLANATION OF PLATE I.

Fig. 1.—H. gnatho ♂ Lec.
" 2.—H. pallidus ♂ Say.
" 3.—H. ventralis ♂ Mels.
" 4.—H. ventralis ♀ *var.*
" 5.—H. gemmatus ♂ Horn.
" 6.—H. undatus ♀ Mels.
" 7.—H. collaris ♂ Kies. The usual longer form from Arizona.
" 8.—H. collaris small variety.
" 9.—H. tristis ♀ Mann.
" 10.—H. Schwarzi ♀ Horn.
" 11.—H. auromicans Kies.
" 12.—H. pusillus Say, var. *limbatus* Kies.
" 13.—Head of gnatho ♂.
" 14.— " brunneus ♂.
" 15.— " gemmatus ♂.
" 16.— " pusillus ♂.
" 17.—Mandible of pusillus ♂.

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Notes on the species of OCHTHEBIUS of Boreal America.

BY GEORGE H. HORN, M. D.

Our species of this genus have been described by Dr. LeConte with the single exception of *Holmbergi*, a type of which is in the collection at Cambridge. At the time of his review of the genus all my material was placed at his disposal and some of the types or duplicate types are now in my collection, so that all the species with one exception are now in my possession.

As the species are all of rather small size it is not an easy matter to describe the thoracic form and sculpture in such a manner as to make the differences easily appreciated. It has, therefore, seemed profitable to prepare sketches of them, so that with the aid of the descriptions the various species may be determined by those who possess them, without the necessity for reference to standard series.

Since the publication of the table of our species by Dr. LeConte (Proc. Amer. Philos. Soc. 1878, p, 378) an important review of the European species has appeared from Mr. A. Kuwert (Deutsche Zeitschr. 1887, p. 369). In this essay the seventy-eight species are divided into sixteen subgenera.

In a study of our species in a comparison with those of Europe it is possible, by allowing a little latitude to the subgenera, to admit certain of our species, while a number might warrant the formation of other subdivisions, but it seems to me unnecessary to burden our nomenclature with names for generic groups which have not full generic value.

The form and sculpture of the thorax give the readiest method of separating the species; these are supplemented by elytral differences which are neither so well marked nor constant. In all the species the thorax is narrowed at base, sometimes gradually with a slight sinuation as in *lineatus*, or with a deep, more or less abrupt sinuation, as in *discretus*. In every case there is a transparent side-margin extending sometimes from the apical angle to base, or merely from the beginning of the sinuation to base. In one species, *benefossus*, the border is extremely narrow and within the emargination. As a rule

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the deeper the sinuation the wider the border, so that in those species with the feeble sinuation the border is very narrow. The apical edge has nearly always a pellucid border.

The sculpture of the disc of the thorax is important in the sepation of the species, and consists of impressed lines or foveæ, which are apparently merely a modification of the simpler forms observed in Helophorus. There is, in the first place, the median impressed line, which may be quite a deep channel or a feeble line. In *sculptus* this line is practically obliterated, while in *Holmbergi* it is very short. Secondly, on each side of the median line are the discal foveæ, which are more or less deep, and vary in form and size. These have a tendency to revert to the simple lineate type of Helophorus, as may be traced through *puncticollis* to *sculptus* and *lineatus*. Rarely these discal foveæ are entirely wanting, as in *cribricollis*. External to the discal are the lateral impressions, which are more or less oblique in position and variable in depth, and in *lævipennis* existing as a mere trace.

The elytral sculpture exhibits the usual variation of the striato-punctate type, the striæ varying in depth and the punctures in size, depth and approximation.

The lateral margin of the elytra is slightly explanate, usually from the humeri to the middle, or slightly beyond, but in *benefossus* extending to the apex.

The species of Ochthebius at present known to me may be recognized by the following table:

Lateral margin of elytra explanate from the humerus to apex. (Cyrtochthebius)

Thorax deeply sinuate at posterior half, the transparent border very narrow; all the dorsal foveæ deep.....**benefossus.**

Lateral margin explanate from humerus to middle or beyond, but never to apex..2.

2.—Thorax abruptly sinuately narrowing from one-third or less posterior to the apical angle, and with a pronounced angulation at middle of sinuation; transparent border broad.....(Odontochthebius) 3.

Thorax abruptly sinuate from the middle, or deeply notched near the hind angles; transparent border broad.

Thorax with well marked discal foveæ.....(Trymochthebius) 4.

Thorax without discal foveæ.....(Homalochthebius) 5.

Thorax gradually sinuately narrowed from apex to base; transparent border narrow.....(Ochthebius) 6.

3.—Thorax with all the discal depressions well marked; elytra with striæ of closely placed punctures; margin of pellucid border continuous. **foveicollis.**

Thorax with very feeble discal impressions, the surface polished; elytra almost absolutely smooth; pellucid margin sinuous...**lævipennis.**

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4.—Sides of thorax behind the front angles straight, the transparent border beginning at the front angles..... **rectus.**

Sides of thorax arcuate in front, the transparent border beginning at the sinuation.

Disc of thorax coarsely punctured, the two discal foveæ on each side united by a deep groove between them. ..... **puncticollis.**

Disc of thorax sparsely punctate, the discal foveæ separated..**discretus.**

Disc of thorax impunctate, the discal fovea separated.....**nitidus.**

5.—Prothorax coarsely punctate, the lateral foveæ deep and broad. **cribricollis.**

6.—Median line of thorax distinct, extending two-thirds the length of thorax..7.

Median line of thorax extremely short or wanting..... 8.

7.—Discal foveæ of thorax of the usual form, but at times shallow.

Discal foveæ deep, the lateral shallow, transparent margin beginning near the front angles..... **interruptus.**

Discal foveæ feeble, the lateral deeper; transparent margin beginning about one-third from apical angles.....**attritus.**

Discal foveæ of thorax forming fine sinuate lines, disc rather flat; transparent border very narrow, beginning at middle..... **lineatus.**

8.—Discal impressions of thorax forming a continuous line; lateral foveæ broad and moderately deep... ..... **sculptus.**

Discal impressions very vague, the posterior pair only distinct, these forming broad shallow depressions which are indefinitely confluent posteriorly; lateral foveæ formed of indistinct sinuous depressions. **Holmbergi.**

The various subgeneric divisions into which our species seem most nearly to fall have been indicated in the preceding table, but with the exception of *Cyrtochthebius*, *Trymochthebius*, and probably *Homalochthebius*, the references are to be taken rather as parallels than positive references. As already intimated the divisions are mere tabular conveniences, and the advisability of attaching to them polysyllabic names seems doubtful.

O. benefossus Lec.—Piceous, surface slightly bronzed, legs pale. Thorax rapidly, arcuately narrowing from slightly in front of middle, the notch thus formed having a very narrow transparent border; apical margin sinuate at the front angles; disc very convex at middle, the sides beyond the lateral foveæ rather flat; surface sparsely punctate; median sulcus rather broad and deep, discal foveæ deep, separated, lateral impressions deep, broader at each end, usually entire, sometimes separated into two elongate triangular foveæ. Elytral margin distinctly explanate from base to apex, disc convex, striæ not impressed, composed of moderately large punctures, separated by their own diameters. Length .06 inch.; 1.5 mm. Pl. ii, fig. 1.

In this species the labrum is feebly triangularly notched at middle. The specimens from which Dr. LeConte described the species were part of my collection, and were the only ones with the deeply sinuate sides of the thorax in which the transparent border seemed absent,

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it was therefore natural that he supposed this structure to be accidental, and that the entire notch, in well preserved specimens, was filled with the membrane. Since that time other specimens have been taken by Mr. C. H. Roberts, in Bennington County, Vermont and all show the narrow border as illustrated.

Occurs in northern New Jersey (Jülich) and Vermont (Roberts).

O. foveicollis Lec.—Piceous, surface distinctly æneous, legs pale. Thorax rapidly, arcuately narrowed from a point one fourth from apex, behind the middle, a second sinuation, the transparent border broad, gradually arcuate; apical margin with rather a deep sinuation within the angle; disc regularly, moderately convex, the surface smooth, with very few punctures; median line deep and long, discal foveæ moderately deep and well separated, lateral impressions large and deep. Elytra moderately elongate, the margin narrowly explanate a little beyond the middle, disc moderately convex with striæ, of closely placed, but with very coarse punctures, intervals at middle narrower than the striæ, the external wider. Length .04—.06 inch.; 1.2—2.5 mm. Pl. ii, fig. 2.

There is an extremely feeble emargination of the margin of the labrum. Having typical specimens before me of *foveicollis* and *tuberculatus*, I have not been able to find any special difference, except that the specimens of the former are smaller in size.

Two individuals from Pennsylvania have the elytra rather more oval, the punctures of the striæ a little less crowded; they may prove a distinct species, but are not really more different than the limits of difference observed in several other species.

Occurs in New Mexico (Moqui Villages), Florida (Enterprise and other places), Pennsylvania (Allegheny).

O. lævipennis Lec.—Dark castaneous, a slight bronze lustre on the head and thorax. Apical margin of thorax rather deeply sinuate within the angles, sides deeply and abruptly sinuate less than one-fourth from apex, a second sinuation from middle to base, the transparent border wide and distinctly bisinuate; disc regularly convex, smooth and shining, with scarcely a trace of a puncture, median line deeply impressed and long, the discal and lateral impressions reduced to two small foveæ on each side in front. Elytra rather broadly oval, the lateral border rather abruptly explanate a short distance behind the humeri and continuing two-thirds to apex, disc convex, surface smooth and shining with merely faint traces of the striæ of punctures. Body beneath colored as above, legs pale. Length .05 inch.; 1.3 mm. Pl. ii, fig. 3.

This species is readily known by the very smooth surface and reduction in number and size of the thoracic discal impressions. When the elytra are viewed directly from above, a short distance from the humeri appears parallel on each side, caused by a subhumeral depression and the rather abrupt expansion of the margin immediately posterior to it.

One specimen in my cabinet from California (Fort Tejon).

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O. rectus Lec.—Oblong, rather depressed, piceous, dark bronzed, feebly shining, legs rufo-testaceous. Apex of thorax nearly truncate, a very slight sinuation within each front angle; side margin straight from angles beyond the middle, then with a moderately deep arcuate sinuation, the transparent border begins at the front angles with regularly arcuate margin, narrower in front and broad at the sinuation; disc regularly convex, the surface coarsely, closely and deeply punctate, median line deep and nearly entire, discal foveæ moderate, not sharply defined, but distinctly separated, lateral impression deep, broader in front and narrowed posteriorly. Elytra oblong oval, not very convex, the striæ composed of large, deep, closely placed, subquadrate punctures, the intervals extremely narrow. Length .06—.08 inch.; 1.5—2 mm. Pl. ii, fig. 4.

This species is the only one in our fauna in which the sides of the thorax are straight for a distance from the apex, and in which, with the deep post-median sinuation, there is a continuous transparent border from the apex to the base. The punctuation of the thorax is also coarser and denser than elsewhere seen, and the punctures of the elytral striæ larger, deeper, and every way more pronounced.

Occurs in California (Tejon and Los Angeles) and Wyoming (Como).

O. puncticollis Lec.—Form rather robust, head and thorax piceous black shining, elytra piceous slightly bronzed, legs pale. Apical margin of thorax distinctly sinuate near the front angles, sides arcuately expanded from apex to middle, thus abruptly arcuately narrowed to base, the transparent border wide and filling the posterior emargination only; disc moderately convex, the punctures moderately coarse, but not closely placed, the intervals smooth and shining; median groove deep and long, discal foveæ deep, the two on each side united by a moderately deep groove, lateral impressions deep and broad. Elytra moderately convex, the striæ composed of coarse, rather closely placed, subquadrate punctures, the intervals about half the width of the striæ. Length .06—.08 inch.; 1.5—2 mm. Pl. ii, fig. 5.

In some specimens the discal foveæ are so completely confluent that the sculpture approaches the type seen in Helophorus. The general sculpture of the surface, although moderately coarse, does not approach that seen in *rectus*, but resembles more nearly that of *discretus*.

Occurs in California (San Diego) and Arizona (Tucson and southward).

O. discretus Lec.—Form oblong, piceous, surface brown bronze, feebly shining; legs pale rufotestaceous. Apex of thorax slightly sinuate within each front angle and narrowly bordered with membrane; sides arcuate in front, at middle abruptly notched, the angle formed rather acute, the emargination deep; the transparent border wide behind, extending very narrowly in front of the emargination. Disc moderately convex, the punctures coarse, moderately close, but not dense, intervals shining; median groove rather broad and deep, discal

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foveæ rather large, deep and well separated, lateral grooves deep. Elytra very little wider at base than the thorax, disc slightly depressed along the suture at base, striæ distinctly impressed, the punctures fine and close, intervals wider, slightly convex and transversely wrinkled. Length .06—.08 inch.; 1.5—2 mm. Pl. ii, fig. 6.

This species varies a little in the punctuation of the thorax; in some specimens it might be called rather sparse, while in most of them it is close, but not dense. It most closely resembles *puncticollis*, but the separate discal foveæ and the less dense punctuation will distinguish them.

Since the publication of the description by LeConte, the distribution of this species is found to be very wide. It extends from Los Angeles, in California, to Arizona, and northward to Oregon, thence eastward to Nevada, Utah, Colorado and Canada.

O. nitidus Lec.—Oblong oval, piceous, surface distinctly æneous, elytra paler, legs testaceous. Thorax fully twice as wide as long, very little narrowed posteriorly near the hind angles; apical border slightly sinuate within the angles, and with a narrow transparent border; sides arcuately divergent from the front angles to middle then abruptly, deeply emarginate to base, the emargination with a broad transparent border which does not extend to front angles; disc moderately convex, sparsely punctate shining, median groove moderately deep, discal foveæ deep and well separated, lateral impression deep, moderately broad, arcuate. Elytra very little broader than the thorax, striæ not impressed, composed of large, closely placed punctures, which become gradually more distant beyond the middle and at apex more obsolete, intervals near base narrower than the striæ, slightly transversely wrinkled. Length .07 inch.; 1.75 mm. Pl. ii, fig. 7.

Among the species here referred to the section Trymochthebius, this one may be known by the comparatively smooth thorax and by the elytral sculpture. In fact no other species has the elytra so nearly smooth at apex, excepting *lævipennis*, which differs in too many other particulars to require comparison.

Evidently very widely distributed. The type is from Eagle Harbor, Lake Superior. Dr. LeConte adds, as a synonym, *fossatus* from Fort Yuma, while my specimen is from Oregon.

O. cribricollis Lec.—Moderately robust, piceous, with brown bronze surface lustre, sides of thorax and elytra paler, legs testaceous. Thorax twice as wide as long, distinctly narrowed to base; apical margin feebly bisinuate and with a very narrow transparent border; sides arcuate, and at basal third moderately deeply emarginate, the notch filled with transparent membrane, which extends a short distance along the base, but not to the apex; disc feebly convex, with coarse, deep, closely placed punctures, the intervals shining, median line rather finely impressed, discal foveæ entirely absent, lateral impression broad,

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deep and arcuate. Elytra a little wider than the thorax, striæ distinctly impressed and rather broad, punctures coarse, deep and closely placed, but finer near the apex, intervals narrower than the striæ and slightly transversely wrinkled. Length .06 inch.; 2 mm. Pl. ii, fig. 8.

This species has the facies of *discretus*, but is readily known among those in which the thorax is deeply emarginate near the hind angles, by the entire absence of discal foveæ.

Occurs at Eagle Harbor, Lake Superior (LeConte), and in my cabinet from California.

O. interruptus Lec.—Form moderately elongate, pale piceous, surface distinctly æneous. Thorax nearly twice as wide as long, the apical margin broadly, but not deeply emarginate, a slight emargination within the angles; sides moderately deeply, but not abruptly sinuate behind the middle, the transparent border beginning very near the front angles and continuing the gradual curve of the sides; disc regularly convex, the punctures moderately coarse, but not close, median line moderately deep and long, discal foveæ moderate in size, deep and well separated, lateral impression deep and arcuate, a slight depression in the hind angles. Elytra oblong oval, not wider at base than the thorax, striæ slightly impressed at the sides, punctures moderate in size, subquadrate, closely placed, intervals as wide as in the striæ, slightly convex and nearly smooth, or slightly transversely wrinkled. Legs pale. Length .06 inch.; 2 mm. Pl. ii, fig. 9.

This species is intermediate in many respects between the series which precedes and those following, the thorax being rather more deeply sinuate behind the middle than in the next four, but much less so than in the preceding. The thoracic sculpture is not very unlike that of *attritus*, but deeper.

Occurs from the Peninsula of California northward to Vancouver, eastward to Wyoming, also in Arizona.

O. attritus Lec.—Moderately elongate, piceo-testaceous, surface distinctly æneous, legs pale. Thorax less than twice as wide as long, apex scarcely emarginate, a slight sinuation within each apical angle, sides slightly arcuate in front, a feeble sinuation beginning slightly in front of middle, the transparent border narrow, continuing the curve of the anterior third; disc feebly convex, the prolongation moderate, not close, median line distinctly impressed, discal foveæ shallow or nearly absent, lateral impression deeper and more coarsely punctured. Elytra slightly wider at base than the thorax, striæ scarcely impressed, punctures moderately coarse, closely placed and subquadrate, the intervals slightly narrower than the striæ, feebly convex and transversely wrinkled. Length .06 inch.; 1.5 mm. Pl. ii, fig. 10.

Under this name are included two species described by Dr. LeConte from uniques, *attritus* and *simplex*, the only perceptible difference being in the degree of thoracic sculpture, the former having the foveæ faintly marked, while in the latter they are nearly obliter-

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ated. There is also a slight difference in size. Inasmuch as the variation here shown is amply illustrated in species more abundantly represented by specimens, and known to have no specific value, the two species have been united.

Occurs in Florida, Haulover (Schwarz).

O. lineatus Lec.—Oblong, feebly convex, piceo-testaceous, surface faintly bronzed, legs pale. Thorax not much wider than long, apex broadly, but feebly emarginate; sides arcuate in front, slightly sinuate and narrowing to base, with a very narrow transparent border. Disc feebly convex, surface granularly alutaceous, not punctured, median line finely impressed, not long, sometimes very vague, discal foveæ replaced by impressed arcuate lines, a vague transverse depression between the apex and base of these lines, lateral impressions shallow, the inner side limited by an oblique line, sometimes a vague impression near the hind angles. Elytra a little broader at base than the thorax, the striæ faintly impressed, punctures moderate and closely placed, intervals slightly convex, and at middle narrower than the striæ. Length .06—.08 inch.; 1.5—2 mm. Pl. ii, fig. 11.

The thoracic sculpture of this species shows the most decided approach to the Helophorus type of any in our fauna. At the same time it seems more nearly to represent the true Ochthebius, of Europe, as defined by Kuwert.

Occurs in Oregon, California, Arizona, Colorado, Texas and New Mexico.

O. sculptus Lec.—Piceous, shining, surface slightly green bronze. Thorax nearly twice as wide as long; apex broadly emarginate, a slight sinuation within the angles. Sides arcuate, a very slight and gradual sinuation beginning at apical third, the transparent border correspondingly narrow. Disc regularly convex, sparsely punctate, the intervals smooth, median line entirely obliterated, discal foveæ replaced by a slender line, lateral fossæ broad but not deep, more closely punctate, a slight fovea near the hind angles. Elytra a little wider than the thorax, striæ not impressed, punctures moderate, subquadrate, not closely placed, finer toward apex, intervals flat, broader than the striæ, faintly wrinkled. Length .06 inch.; 1.5 mm. Pl. ii, fig. 12.

This species is very distinct by the total obliteration of the median line of the thorax. The discal foveæ are replaced here, as in *lineatus*, by an entire slender line, somewhat deeper posteriorly.

Occurs in California and Arizona. Dr. LeConte notes a specimen in my cabinet from Canada, but it is not now before me.

O. Holmbergi Mann.—Piceous, faintly bronzed, moderately shining. Thorax less than twice as wide as long, apex broadly emarginate, without sinuation near the angles. Sides arcuate in front, slightly sinuate toward the base, the transparent border narrow, extending from the front angles and somewhat wider behind. Disc moderately convex, sparsely punctate, median line short,

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feeble, discal foveæ represented by vague, flat impressions, more or less distinctly limited on the outer side by an impressed line, the two posterior foveæ vague, confluent at the median line, lateral impressions broad and shallow. Elytra a little broader at base than the thorax, the striæ slightly impressed, punctures not large, closely placed, intervals slightly convex, as wide as the striæ at middle, or wider at the sides, distinctly wrinkled transversely. Length .06—.08 inch.; 1.5—2 mm.

In the specimens from Canada the thoracic sculpture is extremely vague, while in those from California there is quite a distinct line defining the position of the foveæ in the same position as in *lineatus* or *sculptus*.

Occurs from southern California to Nevada, Colorado, Canada and Alaska.

The species of Ochthebius do not seem to have received much attention on the part of the general collector. Whether this will account for the great inequality of distribution remains to be seen. In looking over the localities given for the species it will be observed that the very large majority of them are either from the Pacific coast region, or from the extreme southwest, as Texas or Arizona. Although collectors of great skill have explored these regions, it is hardly likely that the numerous collectors of our Atlantic region would have allowed them to escape notice. It may, therefore, be possible that but few species remain to be discovered in the eastern regions.

In my own experience Ochthebius prefers clear running, shallow water, in which localities they may be found adhering to the underside of stones, preferably those partly out of water, as they must at times come to the surface for a fresh supply of air. Frequently they are found in small colonies like the smaller Elmidæ, which they much resemble in their habits. They are not so easily detected as Elmidæ, from the fact that their flatter form enables them to lie more closely in contact with the surface of the stone, or hide themselves in small crevices. They are beautifully sculptured insects when seen with moderate magnifying power, and will well repay the trouble of their collection.

From the fact that a certain number are known to have wide distribution, it is probable that careful collection will extend the distribution of others. *O. discretus*, for example, extends the entire length of our west coast and eastward from Oregon to Canada; *O. foveicollis* is known from New Mexico, Florida and Pennsylvania; *O. inter-*

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ruptus is found from Arizona to Oregon. With these few words further observation is left to the industrious collector, with the hope that additional data in distribution will become known and thought worthy of publication.

Bibliography and Synonymy.

OCHTHEBIUS Leach.

O. benefossus Lec., Proc. Amer. Philos. Soc. 1878, p. 381.
O. foveicollis Lec., loc. cit. p. 381.
tuberculatus Lec., loc. cit. p. 380.
O. lævipennis Lec., loc. cit, p. 381.
O. rectus Lec., loc. cit. p. 379.
O. puncticollis Lec., Ann. Lyc. v, p. 210; Proc. Acad. 1855, p. 361; loc. cit. supra p. 378 (table).
O. discretus Lec., Proc. Amer. Philos. Soc. 1878, p. 379.
O. nitidus Lec., Agassiz Lake Superior, p. 217; Proc. Amer. Philos. Soc. 1878, p. 380.
fossatus Lec., Proc. Acad. 1855, p. 362.
O. cribricollis Lec., Agassiz Lake Superior, p. 217; Proc. Amer. Philos. Soc. 1878 (table).
O. interruptus Lec., Ann. Lyc. v, p. 210; Proc. Amer. Philos. Soc. 1878, p. 379 (table).
O. attritus Lec., Proc. Amer. Philos. Soc. 1878, p. 380.
simplex Lec., loc. cit.
O. lineatus Lec., Ann. Lyc. v, p. 211.
O. sculptus Lec., Proc. Amer. Philos. Soc. 1878, p. 381.
O. Holmbergi Mann., Bull. Mosc. 1853, iii, p. 166; Lec., loc., cit. p. 379 (table).

DESCRIPTION OF PLATE II.

Fig. 1.—Thorax of *O. benefossus.*
" 2.— " *O. foveicollis.*
" 3.— " *O. lævipennis.*
" 4.— " *O. rectus.*
" 5.— " *O. puncticollis.*
" 6.— " *O. discretus.*
" 7.— " *O. nitidus.*
Fig. 8.—Thorax of *O. cribricollis.*
" 9.— " *O. interruptus.*
" 10.— " *O. attritus.*
" 11.— " *O. lineatus.*
" 12.— " *O. sculptus.*
" 13.— " *O. Holmbergi.*

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Notes on the species of Dendroctonus of Boreal America.

BY W. G. DIETZ, M. D.

A study of my material of this genus, chiefly undertaken for the purpose of placing some doubtful forms, has led to the discovery of characters definite and easily recognizable, which thus far have been overlooked. Further investigation, covering all the material and representing all the species hitherto recognized, contained in the collections of Dr. Horn, Mr. H. Ulke and Dr. J. Hamilton, has confirmed these and made the separation and identification of the species at once positive and easy of attainment. The anterior margin of the rostrum, which for convenience, I shall here designate as epistoma presents each side of the middle an incisure or cleft, which divides this part into three segments. The middle segment is slightly retracted and somewhat overlaps the lateral segments; it varies so in form, length and width, as to be almost characteristic of each species, and when taken in connection with characters afforded by the structure of the antennæ, determines the exact limits of each species. Without going into a minute description of the characters spoken of, I deem it preferable to illustrate them by the accompanying figures, which I hope will convey a more accurate idea than description could do and which will be referred to in the following pages.

Color is of no value whatever in distinguishing the species, and even sculpture, of such great value in the differentiation of species elsewhere, plays but a very subordinate part here. The hairy vestiture, while fairly constant for each species, has only a relative value difficult of expression.

Although sought for assiduously, I have failed to discover any character positively indicating the sex. Generally speaking, the ♂ ♂ are more slender and more shining, the thoracic punctures and elytral asperities less pronounced and the latter sometimes replaced by punctures on the declivity.

After these preliminary remarks I offer the following analytical table for the identification of our species. It will be seen that *D.*

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punctatus Lec. and *D. brevicornis* Lec. have been omitted, the first cannot be separated from *rufipennis* Kby., while the second is identical with *frontalis* Zimm. But one new species is added to the list.

I have omitted all references to bibliography and have simply confined myself to such remarks as will enable the student to realize the results aimed at in this paper.

Clava* subrhomboidal, third suture always distinct, remote from the apex. Outer joints of funicle more distinctly widened, figs. 1 and 2.

Scape of antennæ triangular, apical angles acute; second joint of funicle longer than the first, fig. 1. Median segment of epistoma short, broad, concave; shorter than the lateral ones; lateral edge oblique, ending anteriorly in a smooth tubercle, fig. 1 *a*. Hairs of moderate length. **terebrans.**

Scape clavate, apex rounded; first and second joints of funicle of about equal length, fig. 2. Median segment of epistoma longer and narrower than in *terebrans*, scarcely concave, as long as the lateral segments, fig. 2 *a*. Rostrum more or less distinctly carinate. Hairs long.....**rufipennis.**

Clava transversely oval; first and second suture distinct, third subapical or indistinct; funicle with the outer joints less distinctly widened, scape clavate, figs. 3–6.

Median segment of epistoma narrow, extending slightly beyond the lateral segments; sides parallel, or nearly so, fig. 3 *a*. Club distinctly transversely oval, sutures curved, fig. 3.....**similis.**

Median segment rhomboidal, not extending beyond the lateral ones; sides oblique, figs. 4 *a* and 5 *a*.

Median segment less strongly narrowed anteriorly, as long as the lateral segments, not concave, fig. 4 *a*. Sutures of club straight, fig. 4. Front convex, not channeled. Thorax strongly narrowed anteriorly. Hairs conspicuous.....**simplex.**

Median segment strongly narrowed from the base, scarcely as long as the lateral ones and more or less concave, fig. 5 *a*. Sutures of club curved, figs. 5 and 6. Front channeled. Thorax feebly narrowed anteriorly, finely punctured.

Larger; second joint of funicle longer than first, fig. 5. Hairs long, distinct.....**approximatus** n. sp.

Smaller; second joint of funicle not longer than first, fig. 6. Hairs inconspicuous .....**frontalis.**

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* Normally, the club is simply compressed, not concave on its anterior face, as spoken of by Dr. LeConte in reference to several species. The concavity when existing is due to shrinkage; any reference to sutures, etc., applies only to the normal structures, as the shrinkage gives rise to irregularity.

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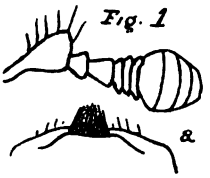
D. terebrans Ol.

Very variable; what may be considered as typical specimens have the front strongly granulate-punctate; occiput densely and obviously punctured; thorax equally so, punctures coarser; median thoracic line entire, subcarinate; thorax at base strongly bisinuate; elytral punctures distinct, transverse, closely placed; interstices rough in their whole extent; color reddish brown. Length 5.2—8.5 mm.; .20—.34 inch.



Eastern States, California, Washington.

The following variations may be recognized:

a.—More coarsely punctured, shining; asperities of elytra forming more or less distinct, transverse rugæ, especially toward the base. Elytral puncture indistinct. Represented by a large pitchy black specimen from Maryland in Mr. Ulke's collection.

b.—Concavity of middle of epistoma somewhat extended upon the front, where it ends in a curved, but obscure ridge; generally more shining and less densely punctured. Punctures and asperities less pronounced. Smooth thoracic line more or less interrupted. Color as in the type, rarely darker. The bisinuation at base of thorax is less strong.

Washington, California, Colorado, Arizona, Idaho.

c.—Front with a central impression; occiput convex, very finely punctured. Thorax more finely punctured, basal bisinuation feeble, elytral punctures sharply defined, asperities less so.

New Mexico, Nevada, Arizona, California.

d.—Front convex, feebly roughened; occiput very finely and remotely punctulate. Base of thorax scarcely bisinuate; in fact, viewed from above, it appears strongly emarginate. Elytral punctures smaller and much less evident than in the preceding variety. Three specimens, a little below average size, were taken by me in Schuylkill County some years ago.

The characters given in the table make the identification of this species at once easy and certain.

D. rufipennis Kirby.

The most variable species. The simply clavate scape and form

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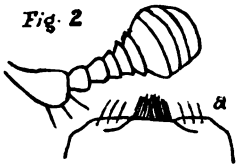
of epistoma distinguish it from *terebrans*, with which it agrees in the formation of the club, which at the same time distinguishes this species from all the following. The rostral carina is strongly developed in some specimens, entirely obsolete in others. The thoracic punctures vary greatly in size and density in different specimens, and are always of varying size in the same. The smooth thoracic line varies from being scarcely noticeable to a strong carina. The asperities of the elytra are feebly developed or else entirely replaced by punctures on the declivity. In the latter case the striæ are very feebly impressed and the surface more shining (♂ ♂). Length 5—7.5 mm.; .20—.30 inch.



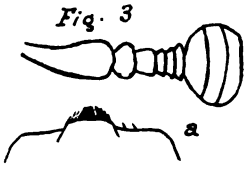
Specimens are before me from Alaska, Canada, New Brunswick, Colorado, Utah, Florida (Pennsylvania *D punctatus*).

I am unable to separate *D. punctatus* Lec. from the present species. A specimen in Dr. Horn's collection is conspicuously clothed with long grayish white hair, the color in all other specimens before me being yellow.

Very closely related to the present is the European species *D. micans* Kug., with which it agrees in the formation of epistoma and antennæ, except that in the latter the second joint of funicle is longer than the first. Save for the latter character, specimens in my collection could not be distinguished from several specimens from Sitkha in Mr. Ulke's collection. In my specimens, however, the front is strongly punctured, not granulate, and the thoracic punctures generally coarser than in any specimen of *rufipes* before me. I add these characters as it is not unlikely that *D. micans* may yet be found within our faunal limits, and thereby enable it to become recognized.

D. similis Lec.

Readily distinguished by the formation of the epistoma. The median segment projects slightly beyond the lateral segments, the sides are straight or nearly so, and continued to the front; the surface is more or less convex and roughened. The lateral spaces are concave; the club is transverse, and in the majority of specimens before me, appears slightly emarginate at tip. The head has two median longitudinal impressions, often connected by an impressed line.



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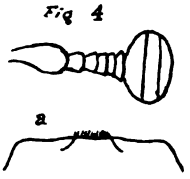
Thorax densely and finely punctured and strongly narrowed anteriorly. Elytral declivity roughened. Hairs long. Length 6 mm.; .24 inch.

Oregon, California, Colorado, Canada.

Two specimens in my collection from Sylvania, Cala., have the elytral declivity very slightly asperate and the hairs much shorter.

D. simplex Lec.

Resembles the last species in general form and also somewhat in the formation of the epistoma. The median segment, however, never extends beyond the lateral segments and the sides are always oblique; the surface is rather convex and roughened. Head convex, with one or two longitudinal impressions. Sutures of club transverse. Thorax rather coarsely punctured. Length 5.0—6.2 mm.; .20—.25 mm.

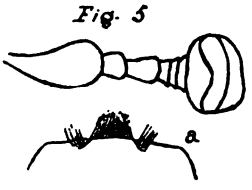


Michigan, Colorado, Lake Superior, California.

Seven specimens before me present scarcely any variation. This species is readily distinguished from the preceding ones by its much smaller size and from the two following by its strongly narrowed thorax.

D. approximatus n. sp.

Elongate cylindrical, rather shining and thinly clothed with moderately long, yellow hairs. Head broad; front coarsely granulate, channeled. Antennæ, second joint of funicle longer than the first; club large, sutures curved; middle segment of epistoma shorter than the lateral segments, sides strongly oblique; surface concave. Thorax about one-half wider than long, slightly narrowed anteriorly; shining, punctures moderate, not closely placed· smooth median line indistinct; a strong transverse impression about one-fourth from the anterior margin; base strongly bisinuate. Elytral striæ moderately impressed. punctures confused, interstices asperate. Hairs more conspicuous on the declivity. Length 5—6 mm.; .20—.24 inch.



Four specimens, two ♂ ♂ and two ♀ ♀ from New Mexico and Colorado in Dr. Horn's collection are before me. But for its large

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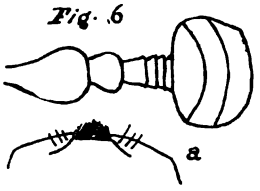
size, this species might readily be taken for *frontalis*, with which it agrees in the large head, form of epistoma and structure of antennal club, but easily distinguished by the greater length of second joint of funicle and greater length and more conspicuous hairs. The thoracic punctures are also a trifle coarser than in that species.

D. frontalis Zimm., **D. brevicornis** Lec., Proc Amer. Philos. Soc. xv, 386.

After careful examination of typical specimens of each, no doubt of their identity is left in my mind. The structure of the epistoma and the antennæ is alike. In some ♂ ♂ the very short hairs on the elytra are intermixed with a few, scattered, longer ones. With the exception of two specimens from New Mexico and California the front is channeled in all; the frontal tubercles are variable in development. The sutures of the club are curved. Length 2.75—4.0 mm.; .11—.16 inch.



California, Arizona, Maryland.

Easily recognized by its small size. The resemblance to *approximatus* has been referred to under that species.

In conclusion I desire to call the attention of collectors to the necessity of collecting observations and data in the life-history of the Scolytidæ. Especially as to the time of their appearance, and to the collecting of specimens of bark demonstrating the larval passages from the time the larva leaves the ovum until it reaches the pupal stage. The necessity of this will be evident to all who contemplate the future of our North American forests.

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Notes on some North American ODONATA with descriptions of three new species.

BY PHILIP P. CALVERT.

(In the following paper I have followed the generic divisions of Dr. Hagen's "Synopsis of the Odonata of N. America," 1875, in Proc. Bost. Soc. Nat. Hist. xviii, pp. 20–96.)

Epitheca Walshii Scudder.

In 1875, Dr. Hagen recorded this species as only from the White Mountains of New Hampshire. Miss Mattie Wadsworth took a single male of this species at Manchester, Kennebec Co., Maine, on July 16, 1888. Thanks to the kindness of Miss Wadsworth, I have compared this male with Mr. Scudder's original description (Proc. Bost. Soc. Nat. Hist. x, p. 217); the only differences which I noted were that this male has no yellowish spot on the side at base of the fourth abdominal segment, and has a yellow spot on each side of the sixth and seventh segments at apex.

Mr. William Sheraton took a female, which I believe belongs to this species, at Pictou, Nova Scotia, July 23, 1889. The female *Walshii* has not hitherto been described. This female differs from the male as follows:

♀.—Nasus more yellowish. Anterior femora entirely brown, except at the apex. Abdomen with a yellow spot on each side of segments 4 and 8 at base, but no yellow spot on each side of 6 and 7 at apex; dorsum of 10 entirely black. Abdomen shaped as in the ♂, but a little wider at the base, not so narrow at the third segment, and the apex of fifth is not quite as wide as the first segment. Appendages twice as long as the last two segments, simple, straight, subcylindrical, narrower at the base, clothed with short hairs, apex acute. Vulvar lamina erect, excavated within, apex rounded, entire.

Total length 48 mm. Abdomen (incl. app.) 36 mm. Appendages 4 mm. Anterior wing 33 mm. Posterior 32 mm. Pterostigma 3 mm.; 8 antecubitals on the anteriors, 5 on posteriors. Postcubitals, anteriors R 6, L 5, posteriors 6; 3 discoidal areolets, then 2 rows on anteriors; 2 rows, then 3 rows, on posteriors. Discoidal triangles of all four wings crossed by one vein.

The ♀ *Walshii* is much like the ♀ *forcipata* Scud., specimens of which I have not seen. Baron de Selys (Syn. Cordul. 1871) describes the ♀ *forcipata* as having the "abdomen épais à la base, non etranglé, ... écaille vulvaire . . paraissant un peu emarginée au milieu," which, in addition to the color differences, apparently separate it from ♀ *Walshii*. In his Second Addit. Syn. Cordul., 1878, Baron de Selys places *Walshii* in that group of his subgenus *Somatochlora* characterized by the females having the "écaille vul-

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vaire, médiocré, émarginée ou fendue." In his list of species of *Cordulina*, appended to the Second Additions, he indicates that he has seen only the male *Walshii*. He has, therefore, probably placed *Walshii* in that group for reasons based on the relations of the male to the males of other species of *Somatochlora*.

Libellula incesta Hagen.

Miss Wadsworth has sent me three males and three females of this species from Manchester, Kennebec Co., Maine, taken June 18, 19, 25, July 9, 16, 1889. The males agree with Dr. Hagen's description (Syn. of 1861, p. 155). The female has not been described. A description of my specimens follows:

♀.—Frons deeply grooved above, brown, lighter on the sides. Nasus brown, yellowish on sides. Rhinarium brown. Labrum yellowish, brown at the middle of the base. Labium, labial palpi yellowish. Vertex truncate at apex, dark brown with a yellow spot above posteriorly. Occiput dark brown, with a divided yellow spot behind. Rear of eyes dark brown, with two yellow spots.

Anterior lobe of prothorax brown, with a median, dorsal yellow spot; posterior lobe yellowish, entire.

Dorsum of thorax dark reddish brown, with a median yellow stripe. Sides light yellow, dark brown at bases of wings and of feet, a short brownish line on the second lateral suture. Pectus yellowish.

Feet black; trochanters and coxæ yellowish, also the anterior femora inferiorly.

Abdomen yellowish. Dorsum of 1 brownish. A dark brown median dorsal stripe on 2-9. Dorsum of 10 obscure yellowish. A brown stripe on the sides of 1, 2, and the apical half of 3. Abdomen beneath obscure yellowish.

Appendages longer than the 10th segment, simple, straight, apex acute.

Vulvar lamina erect, but short; its outline, viewed directly from below, is almost semicircular.

Wings hyaline; a brownish basal streak on all the wings, between the subcostal and median nervules, hardly extending to the first antecubital;* the nodus surrounded by a brownish tinge, and the apex edged with brownish. Pterostigma very dark brown, surmounting parts of 5–6 cellules. Antecubitals, 16–17 on anteriors, 12-14 on posteriors. Postcubitals 11–13 on anteriors, 13–14 on posteriors; 4, then 3 rows of discoidal areolets on anteriors; 3, then 2 rows on posteriors. Discoidal triangle of anteriors usually crossed by two veins, of posteriors crossed by one vein. Internal triangle of anteriors of 4 cellules, not always formed in the same manner. No internal triangle on posteriors. One hypertrigonal on anteriors, placed over the discoidal triangle. No hypertrigonals on posteriors (a trace of one exists in one wing of one specimen). One basal postcostal cross-vein, usually, but not always, placed nearer the base than the first antecubital.

Total length 50–51 mm. Abdomen 33–34 mm. Anterior wing 40 mm. Posterior 39 mm.

* In one of my three specimens the basal streak extends to the third antecubital on the anteriors, to the second antecubital on posteriors.

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My three specimens are of different ages; in the oldest individual the colors are darker, often pruinose, the yellowish colors on the head become brownish, the yellow on the sides of the thorax is more restricted.

A hitherto unrecorded locality for this species is New Jersey, where Mr. S. F. Aaron has taken males on July 21st (Amer. Ent. Soc. collection).

Lepthemis gravida (Hagen mss.) n. sp.

♂.—Vertex prominent, dark metallic blue (brownish in younger individuals), truncated and slightly grooved at summit. Frons dark metallic blue (or brownish), sometimes with a brownish spot each side above, with a median groove above. Nasus yellowish, brownish or bluish in the middle. Rhinarium yellowish or brownish. Labrum dark metallic blue. True labium black. Labial palpi yellow, internal margin broadly edged with black. Mandibles black, with a yellow spot at base. Occiput dark brown. Rear of eyes black, with two yellow spots (obscure in older individuals).

Prothorax pruinose, anterior lobe with its anterior margin edged with yellow, posterior lobe broad, bilobed.

Thorax reddish brown (pruinose in older individuals); a more or less distinct transverse black band at anterior margin, some blackish marks near the bases of the feet.

Feet black, or dark brown.

Abdomen bright yellowish, or reddish brown, dorsum of segment 2 sometimes blackish at apex; 3 with a small black spot on each side of the dorsum at apex, or as in 4-9; 4-9 with a dorsal median black band, dilated at the apex and sometimes at the base of each segment; on 9 the reddish brown is reduced to a small spot each side; dorsum of 10 with a small blackish spot at base. Abdomen beneath light brownish, most of the segments with a blackish streak each side. In older individuals the abdomen is mostly pruinose, except the last segment. The abdomen is compressed at base, slightly narrower at 3, becoming a little wider at 6, thence decreasing slightly to the apex.

Genitalia of second segment as follows: Anterior lamina stout, deeply bifid, its apices projecting further downwards than any other part, and armed with short spines Hamule small, simple, curved; apex acute, black, directed outwards. Genital lobe short, projecting downwards as far as the hamule projects, or a little farther, rounded at the apex, which is broader than at the base.

Superior appendages a little shorter than the last two segments, brownish, with short hairs. Viewed from above, they are approximately parallel; each appendage is constricted after the base, and gradually becomes thicker towards the apex, especially on the internal side; apex obtuse, rounded, bearing a minute terminal spine.

Viewed from the side (see Pl. V, fig. 11), each appendage curves downwards from its base, becoming thicker towards the apex; the inferior margin at a little more than midway from the base bears a rather prominent tooth, and, on the basal side of this tooth, 7 to 10 denticles.

Inferior appendage extends a short distance beyond the tooth of the superiors. Viewed from below (Pl. V, figs. 12, 13), its lateral margins are seen to converge

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slightly from base to apex, which is broad, and excised from side to side; in the middle of this excision there is usually a small tubercle, sometimes wanting. Viewed from the side (fig. 11) the appendage is dilated a little before the apex, which is slightly curved upwards.

Wings hyaline, veins brownish; a very slight reddish brown tinge at base, apex edged with brown, and a reddish brown cloud extending from the nodus, or a little before it, half way or more to the pterostigma, and from the costal margin half way or more across the wing. In the younger individuals this cloud is light yellow, sometimes almost absent. Pterostigma long, bright yellow, surmounting one or two cellules. Membranule small, dusky; 10-13 antecubitals on anteriors, 7-8 on posteriors; 9-12 postcubitals. Usually three rows of discoidal areolets on anteriors, two rows on posteriors. Discoidal triangle of anteriors crossed by a single vein,* of posteriors free. Internal triangle of anteriors of three cellules. No internal triangle on posteriors. No hypertrigonals.† One basal postcostal cross-vein, placed nearer the base than the first antecubital.

♀.—Differs from the ♂ as follows:

Vertex generally with a yellow spot above. Labium and labial palpi sometimes almost entirely light brown. A yellow spot on each side of the frons above. Occiput often yellowish. Sometimes a short dark brown mark on the lateral sutures of the thorax. Appendages brown, as long as the last two segments, simple, straight, apex moderately acute; tubercle between them at their bases, prominent, yellow. Vulvar lamina slightly notched in the middle. In some young females, the cloud on the middle of the wings is only distinctly represented by a yellowish costal streak, extending from the fifth or sixth antecubital to the seventh or eighth postcubital. (The same differences of color exist in females of different ages as in the males).

Measurements (in millimeters):

	♂	♀
Total length	46—53	46—56
Abdomen (incl. app.)	32—37	33—40
Appendages	2.25—2.5	2.5—3.25
Anterior wing	37—42	36—44.5
Posterior wing	35.5—39.5	35—42
Pterostigma	4—4.5	4—5

The above description is based on eleven males, ten females from Florida, and four males, ten females from Texas. Mr. E. M. Aaron tells me that he has taken this species at Tarpon Springs and Ponto Rasso, on the Gulf coast of Florida, and that the Texan specimens just referred to were taken by Mr. S. F. Aaron near Corpus Christi and the Nueces River.

Leucorhinia Hageni n. sp.

♂.—Vertex metallic black, with a yellowish spot above. Frons, epistoma and labrum cream-white. Frons with a median groove above, and a transverse black

* In one wing only of two individuals there were two cross-veins.

† One ♀ had one hypertrigonal in both anteriors.

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stripe in front of the eyes, extending also on the sides of the frons. Labium and labial palpi black, the external margin of the latter edged with brown. Occiput yellowish brown, darker on the sides. Eyes behind black, with a single yellowish spot.

Prothorax blackish, with a dorsal median yellowish spot on both lobes.

Dorsum of thorax reddish brown, with long, light-colored hairs; a broad, black, median band, which barely attains the summit of the mesothoracic crest, and a humeral black stripe. Sides brownish, with two broad, oblique, black bands, one in front, the other behind the spiracle. Pectus blackish varied with yellowish.

Feet black.

Abdomen black: dorsum of 3–7 with an elongated, median, dorsal yellow spot; 2 mostly yellow, a black spot each side at base; the dorsal yellow spot of 3 extends to the sides at base.

Genitalia: viewed from the side (Pl. V, fig. 3) the internal branch (*a*) of the hamule is rather slender, moderately curved, apex acute; external branch bifid. Viewed ventrally (fig. 4), the bifid portion of the external branch is seen to have one of its divisions (*c*) short, straight and directed outwards and upwards,* while the other division (*b*) is longer and curved inwards and downwards towards its fellow of the opposite side, and has a more acute apex. Genital lobe moderate, hairy at apex.

Superior appendages black, not quite as long as the last two segments; viewed from above, each appendage is straight, narrow at the base, becoming somewhat dilated towards the apex, which is acute. Viewed from the side, each forms a convex curve with the convexity upwards, becoming slightly and gradually dilated from a little after the base to the apex, which is obliquely truncated, so that the truncating line forms an obtuse angle with the inferior margin and an acute angle with the superior margin; inferior margin bears 8 or 9 denticles.

Inferior appendage not as long as the inferior margin of superiors. Viewed from the side, it forms a concave curve with the concavity upwards, apex slightly recurved. Viewed from below (fig. 2), it is broad, lateral margins straight, almost parallel, apex broad, excised from side to side.

Wings hyaline. Anteriors with two dark brown basal streaks, the first between the subcostal and median nervules, the second between the submedian and postcostal nervules; both extend from the base to about one half the distance to the first antecubital. Posteriors with a dark brown basal streak between the subcostal and median nervules as far as the first antecubital; and a dark brown basal spot, whose anterior margin is the submedian nervule, along which it extends to a short distance beyond the basal postpostal cross-vein, whence its external margin runs obliquely to the apex of the membranule. Costa of all the wings yellowish (except at the base, and superior margin of pterostigma), especially for a short distance beyond the pterostigma. Pterostigma dark brown, with a yellow vein at each end, surmounting one and parts of two other cellules. Membranule dusky; 7 antecubitals on anteriors, 6 on posteriors; 7 postcubitals. Two rows of discoidal areolets on anteriors, irregular on posteriors. All discoidal triangles and the internal triangle of anteriors free. No internal triangle on posteriors; no hypertrigonals. One basal postcostal cross-vein placed nearer the base than the first antecubital.

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* That is, upwards with respect to the position of the insect when alive.

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♀.—Differs from the male as follows:

Frons, epistoma and labrum brownish. Labial palpi with a distinct light-colored spot at the anterior outer angle (there is an obscure trace of such a spot in the ♂). Dorsum of thorax brown, with no reddish tinge; median band obscure, no humeral band. Sides of 4th and 5th abdominal segments with a yellow spot at base. Appendages longer than segment 10, hardly as long as 9, simple, cylindrical, straight, apex acute. Vulvar lamina (Pl. V, fig. 10) bifid, internal margins of the lobes almost touching each other, apices rounded, hardly reaching to one half the length of the 9th segment. Basal streaks of anterior wings reaching to the 1st antecubital, with clearer yellowish spots. Basal streak of posteriors a little longer; basal spot with small yellow spots and veined with yellow. Pterostigma longer; 6 postcubitals on anteriors. Discoidal triangle of anteriors crossed by one vein. One cross-vein in the internal triangle of left anterior.

Total length, ♂ 29.5 mm.; ♀ 29 mm. Abdomen (incl. app.) 20 mm. Anterior wing 22 mm. Posterior 21 mm. Pterostigma ♂ 1.5 mm. ♀ 2 mm.

The above description is based on one male, one female from Pictou, Nova Scotia, taken June 25, 1889, by Mr. Wm. Sheraton.

I suppose this species to be one of the three—*borealis*, *frigida* and *glacialis*—named, but not described, by Dr. Hagen in 1875. As I am unable to determine which of these three names belongs to this species, I have preferred to avoid any possible confusion arising from a use of one of them. I name this species after Dr. H. A. Hagen, whose kind aid to me, at various times, I thus acknowledge. With his assent I have published the three new species of this paper.

Leucorhinia proxima (Hagen mss.) n. sp. Hagen, Proc. Bost. Soc. Nat. Hist. xviii, p. 79, 1875 (no description).

♂.—Vertex black. Frons and epistoma greenish white. Frons with the usual median groove above, and a transverse black band in front of the eyes, extending also on the sides of the frons. Labrum cream-yellow. Labium black; labial palpi varying from yellowish with the inner edge margined with black, to entirely black. Occiput black above, a brownish spot behind. Rear of eyes black.

Thorax reddish brown, with light-colored hairs; dorsum with a very broad median blackish band, not reaching upwards to the wing-bases, and a blackish humeral stripe. At times the black extends over almost the entire dorsum. A black stripe on the second lateral suture; an irregular black band runs from the 2d to 1st lateral suture above the spiracle. Pectus reddish brown, sometimes marked with blackish.

Feet black, coxæ partly reddish brown.

Abdomen black; segments 2 and 3 mostly yellowish on the sides, and pruinose on the dorsum; 2 with a blackish spot each side at base, and sometimes blackish at apex; apex of 3 blackish, especially on the sides. Abdomen sometimes pruinose underneath.

Genitalia: viewed from the side the internal branch of the genital hamule is shorter and more strongly curved than in *Hageni*, and the external branch does not appear bifid (Pl. V, fig. 5). Viewed ventrally (fig. 6), the two divisions of the external branch in *Hageni* are represented; the one (*c*) is similarly directed,

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but is much shorter than in *Hageni;* while the other (*b*), incurved towards its fellow of the opposite side, is hardly as long as (*c*,) and much shorter than its homologue in *Hageni*. Genital lobe moderate, apex hairy.

Superior appendages longer than the 10th segment, black. Viewed from above, they converge slightly from the base to about half their length, after which they slightly diverge; each appendage becomes thicker towards the apex, especially on the inner side, and ends in an acute point. Viewed from the side, each appendage is nearly straight, or slightly curved upwards at the middle; the thickness of the appendage at the base is somewhat less than at the apex, which is formed as in *Hageni;* the inferior margin bears six to eight denticles.

The inferior appendage as in *Hageni*, but viewed from the side, the concavity of its curve is not so pronounced.

Wings hyaline. Anteriors with two very short dark brown basal streaks, one between the subcostal and median nervules, the other between the submedian and postcostal nervules; the first of these two extends hardly one-fourth of the distance to the first antecubital, the second is slightly longer. Posteriors with a very short dark brown basal streak between the subcostal and median nervules, extending one third the distance (or a little more) to the 1st antecubital; and a dark brown basal spot as in *Hageni*. Costa and pterostigma as in *Hageni*, but the pterostigma has a brown vein at each end. Membranule dusky; 6-8 antecubitals on anteriors, 6 on posteriors, 7-11 postcubitals on anteriors, 8-9 on posteriors. Two or three rows of discoidal areolets Discoidal triangle of anteriors crossed by a single vein, of posteriors free. Internal triangle of anteriors of three cellules (one wing of one specimen has two cellules). No internal triangle on posteriors; no hypertrigonals. One basal postcostal cross-vein, placed nearer the base than the 1st antecubital.

♀.—Unknown to me.

Measurements of the ♂. Total length 33-36 mm. Abdomen (incl. app.) 22.5—24.5 mm. Superior appendages 1.5 mm. Anterior wing 25—27 mm. Posterior 25—26 mm. Pterostigma 1.5—2 mm.

The above description is based on three males from Manchester, Kennebec Co., Maine, taken July 10, 11, 16, 1888, by Miss Mattie Wadsworth, and two males from Pictou, Nova Scotia. taken July 26, 1889, by Mr. Wm. Sheraton.

In 1875, Dr. Hagen gave the following localities for this species: British America, Vancouver's Island, White Mountains and Massachusetts.

The identity of my specimens with Dr. Hagen's species is established by the fact that one of the males which I possess from Maine was seen by Dr. Hagen, and has the label "*proxima*" in his handwriting, attached.

Leucorhinia intacta Hagen.

Plate V, figs 1, 7, 8, 9, show the inferior appendage and the genitalia of the second abdominal segment of the male, and the vulvar lamina of the female, for comparison with the similar parts of *L. Hageni* and *proxima*.

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I have examined eleven males of *intacta* from Maine, Pennsylvania and South Dakota, in all of which I find that when the inferior appendage is viewed from below, its lateral margins diverge very perceptibly from base to apex. In the males of *Hageni* and *proxima* which I have seen, the lateral margins are approximately parallel.

The internal branch of the genital hamule in *intacta* varies to some extent in different individuals, being sometimes more slender than fig. 7 represents it.

In addition to the localities given for *intacta* by Dr. Hagen in 1875 (Massachusetts, Ohio, Illinois, Wisconsin and Ontario), I can add Manchester, Kennebec Co., Maine, May 25th to July 4th (by Miss M. Wadsworth); Volga, Brookings Co., South Dakota, June 27th (by Mr. P. C. Truman); Philadelphia, June 17th, and Bristol, Pa., June 16th (by Mr. S. F. Aaron in Amer. Ent. Soc. collection).

EXPLANATION OF PLATE V.

Fig. 1. Inferior appendage of *Leucorhinia intacta* ♂ viewed from below.
" 2. The same of *L. Hageni* ♂.
" 3. Genitalia of *L. Hageni* ♂, viewed from the side.
" 4. " " viewed from below.
" 5. Genitalia of *L. proxima* ♂, viewed from the side.
" 6. " " viewed from below.
" 7. Genitalia of *L. intacta* ♂ viewed from the side.
" 8. " " viewed from below.
" 9. Vulvar lamina of *L. intacta* ♀.
" 10. Vulvar lamina of *L. Hageni* ♀.
" 11. Appendages of *Lepthemis gravida* ♂, viewed from the side.
" 12, 13. Two forms of inferior appendage of *L. gravida* ♂, viewed from below.

a, Internal branch of genital hamule.
b, Internal division } of external branch of genital hamule.
c, External division }
d, Genital lobe.

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Descriptions of some new species of AGROTIS Auct.

BY JOHN B. SMITH.

Agrotis abnormis sp. nov.—The general color is carneous gray, variably shaded or suffused with a more reddish tint. Palpi brown at sides; a broad blackish transverse band at base of collar. Primaries with basal line present, geminate, black, dentate. T. a. line geminate brown or blackish, the inner line faint, included space paler in dark specimens, concolorous in pale examples; upright, outwardly angulate below costa, in the submedian interspace, and again below the internal vein. T. p. line single, or with the outer part of geminate line indicated only by a dusky costal spot and a short dusky shade, its course outcurved over, and very close to reniform, then very evenly parallel to outer margin. S. t. line very slightly paler, outwardly angulated on veins 3 and 6, emphasized by a distinct dusky preceding shade, which in pale specimens sometimes becomes the most prominent feature. A narrow, interrupted, dark terminal line. Claviform very faintly indicated by a few dark scales. Orbicular well sized, oval, oblique, sometimes not completely defined posteriorly, narrowly black ringed, concolorous in pale specimens, paler in darker examples. Reniform narrowly black ringed, of the gray ground color with a more leaden gray filling, prominent inferiorly. Secondaries of the usual dirty gray-brown, somewhat paler in the male, discal spot evident. Beneath powdery fuscous, paler in the male, with distinct, though sometimes interrupted outer line and an evident discal spot on all wings. Expands 1.37—1.50 inches; 34—37 mm.

Habitat.—Sierra Nevada, Cal. (McGlashan).

The structural characters are: fore tibiæ armed, clypeus tuberculate, antennæ of male simple, ciliate; abdomen not depressed. The present species is the only one under this catagory in which the normal Noctuid maculation is present without longitudinal strigæ, and the species really seems at first sight allied to some of the *tessellata* group. The genital structure is not, however, typical of that group, the short branch of the clasper being absent. The simply ciliate, scarcely serrate male antennæ are unusual associates for the other characters.

Several specimens; types with Mr. Edwards and in the college collection.

Agrotis erratica sp. nov.—General color dull ashen gray to brick red, smooth and dense in appearance. Palpi dark at side. Head and thorax immaculate. Primaries very evenly clothed, the lines not much darker and not prominently relieved. Basal line indistinct geminate. T. a. line geminate, the lines very narrow, faint, outwardly oblique, not very much angulated. T. p. line rather regularly outcurved, geminate, inner line narrow, broken below vein 3; outer

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line punctiform. S. t. line pale, very slightly less so than ground color, relieved by a dusky preceding line, and a general dusky coloring of the terminal space; its course very slightly irregular. In the reddish forms the transverse lines are almost entirely obsolete. Claviform wanting. Ordinary spots evenly dark filled, with a narrow defining line, small in size. Orbicular slightly oval, oblique; reniform rather narrow, upright, very slightly constricted. Secondaries glistening, smoky fuscous, somewhat paler basally. Beneath pale, powdery fuscous, with a darker outer line and discal spot. Expands 1.36—1.50 inches; 34—37 mm.

Habitat.—Sierra Nevada, Cal. (McGlashan), Calif. (Neumoegen).

This species is very distinct from any other known to me by the peculiar association of structural characters, combining the habitus of the *cupida* group with the antennæ, but not frontal characteristics of the *pityochrous* section, and peculiar and different from all by the distinct ridge or crest to the thorax. In this feature it resembles *Glœa* or allies, but the form is not depressed. It will probably form a new generic type characterized by smooth front, palpi with second joint clavate, third joint minute, forming a short snout with the frontal vestiture; anterior tibia unarmed, middle and posterior spinose, thorax with vestiture smooth, consisting of flattened hair and scales, with a distinct crest anteriorly. The genital structure is not unlike that of the *cupida* group, and the insect is not unlike *cupidissima* in character. The thoracic crest is perfect in but one specimen before me.

Types are in collection Rutgers College, coll. Hy. Edwards, and coll. B. Neumoegen.

Agrotis planifrons sp. nov.—General color a bluish ash-gray: sides of palpi blackish; collar black tipped; thorax immaculate. Primaries with a distinct vinous red shade through the lower half of the wing, less marked in the basal and terminal spaces. Basal line single, black, strongly dentate, running to the basal dash. T. a. line single, broader on costa and internal margin, strongly dentate between veins, slightly oblique outwardly. T. p. line broad, distinct, crenulate, outwardly curved over reniform, and inwardly sinuate below, the curves very even and not strong. A broad, diffuse, median shade crosses the reniform, then runs parallel and rather close to t. p. line, darkening the median space beyond, to the t. p. line. S. t. space becoming gradually darker to the s. t. line, which is defined and limited only by the contrast of this dark shade against the concolorous terminal space. A row of black terminal lunules. A black longitudinal dash at base extending to t. a. line. Claviform wanting. Orbicular concolorous, black ringed, elongate, the ends drawn out, the one reaching the t. a. line the other to the reniform, which is narrow, lunate, incompletely defined, darkened by the transverse median shade. Secondaries white, veins a trifle soiled, and with a dirty indefinitely marked outer border. Beneath, primaries fuscous, powdery, paler costally where the outer transverse line is visible; secondaries paler, more powdery, with outer line marked across costal space only; a distinct discal spot. Expands 1.37 inches; 34 mm.

Habitat.—N. W. British Columbia.

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A single specimen only, from Mr. Neumoegen, in good condition; the combination of structural characters is peculiar to this species and to *congrua*. The front is flat, the palpi short, second joint very broad at tip, terminal joint minute, as a whole resembling the *cupida* group. Fore tibia spinose, but not very heavily armed and scarcely abbreviated. Antennæ with the joints marked, laterally furnished with tufts of hair resembling thoee of the *pitychrous* and *messoria* groups, but not so well developed; vestiture of flattened hair and scales; thorax with an indefinite anterior divided crest; the maculation is also distinctive, and as a whole the species is intermediate between the forms like *tessellata* and *saucia*, forming a distinct group. The species is very handsome as well as unique.

Agrotis congrua sp. nov.—Ashen gray, palpi dark at the sides; collar with a narrow, dark, transverse line, above which is a series of white scales, the tip of collar marked with a reddish, almost ferruginous shade. Thorax immaculate. Primaries with a somewhat ferruginous shade extending through the middle of the wing into the s. t. space and tinting that space nearly its full length; veins somewhat dark marked. Basal line marked on costa only. T. a. line single, marked by a distinct costal spot, from which the line is traceable through the cell, twice dentate in this course, then not again visible, except as a curved mark below the internal vein. T. p. line traceable for its entire length, single, not prominent, rather even, with little outward spurs on the veins. S. t. line indefinite, paler, interrupted, marked by the slight contrast between terminal and s. t. space created by the rusty tinging of the latter. A row of dusky terminal lunules; no basal dash, no claviform. Orbicular elongate, black ringed, connected with the reniform by a short spur-line; reniform incomplete, indefinite, the inner outline only defined. Secondaries whitish, glistening with the veins dusky and with a faint discal lunule. Beneath whitish, powdery, with a diffuse outer line on each wing visible only across the costal region. Expands 1.36 inches; 33 mm.

Habitat.—Oregon.

A single male in good condition is before me. The species agrees perfectly with *planifrons* in the group characters, and is closely allied to that species in general type of maculation. There are so many differential characters, however, that there is not the slightest danger of confusing them.

Agrotis inelegans sp. nov.—General color dull blackish brown Head and palpi concolorous: collar with a reddish suffusion, more marked at the tip and extending to base of costa of primaries; thorax with base of patagiæ and the tips of the small anterior and posterior tufts, also more reddish and slightly contrasting. Primaries with a slight reddish shading basally along costa, else quite uniform, save that the median space is a trifle darker than the rest of the wing. Basal line geminate, black, distinct. T. a. line geminate, blackish, dis-

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tinct, outwardly oblique and quite even; a small outward curve only in the interspaces. T. p. line marked by a geminate black spot on the costa, thence indicated only by the slight contrast between median and subterminal space; outwardly well curved over the reniform, and somewhat incurved below. S. t. line prominent, a narrow, slightly irregular line of yellowish white scales scarcely interrupted save toward costa and inner margin. Claviform faintly marked. Ordinary spots moderate in size, normal in form, concolorous, outlined by a narrow line of pale scales surrounding each. Secondaries and abdomen smoky fuscous. Beneath fuscous, powdery, with a reddish shading, more marked on secondaries; an outer, interrupted, transverse line and a discal spot on secondaries only. Expands 1.25 inches; 31 mm.

Habitat.—Sierra Nevada, Cal. (McGlashan).

In structural characters this species is nearest to *mirabilis* in the *cupida* group; front smooth, palpi short, scarcely forming a snout as in *cupida*, fore tarsi not spinose; thorax with a small anterior and posterior divided crest, abdomen depressed. It is an intermediate form between the *cupida*, *exsertistigma* and *stellaris* groups, with the wing form of the former, the tufting of the second, and the maculation of the third. Its best place is probably next to *mirabilis*.

A single female in good condition is before me.

Agrotis clemens sp. nov.—Pale luteous gray, with black powderings, the vestiture smooth, glistening. Head, collar and thorax concolorous, immaculate. Basal line distinct, geminate, black. T. a. line geminate, outer line broader, more distinct, the lines irregular, and as a whole the line irregularly outcurved and bent in the interspaces. T. p. line distinctly geminate, interrupted, the inner line consisting of a series of irregular lunate spots; outer line an almost evenly curved series of distinct venular dots. S. t. line pale, very slightly and irregularly sinuate, the line marked by a distinct, dusky preceding shade. A series of blackish terminal dots. A diffuse median shade darkens the cell between the ordinary spots and is continued vaguely to the hind margin, varying in distinctness. Claviform wanting; the ordinary spots are vague, indefinite, of a very slightly paler shade than the ground color; the reniform marked with dusky. Secondaries pale smoky, somewhat whitish, the veins fuscous. Beneath whitish, powdery, with an outer line and discal spot to all wings. Expands 1.50—1.65 inches; 38—41 mm.

Habitat.—California (Neumoegen).

The specimens before me are all females, and show all the characteristic features of the *clandestina* group of the genus. The species has no close allies in the group, and while evidently referable near to *clandestina* and *havilæ* in the table, is in some respects rather intermediate between the type of the group and *haruspica*. The abdomen of the ♀ is not depressed; there is some resemblance to *pyrophiloides* in the habitus, which, however, is not likely to prove misleading.

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S. volubilis Harv.

A number of specimens of this species were in the collection, so different from the general run of specimens that I applied the name *dentilinea* to the form. Compared with ordinary specimens of the eastern or western forms the maculation is much more distinct, the colors brighter and the s. t. line very prominently dentate. It may be that this form, which is also narrower winged than type forms of *volubilis*, will eventually prove distinct, but I have no specimens at hand sufficient to determine this at present; *stigmosa* refers to the same form as *volubilis*.

Agrotis satiens sp. nov.—General color luteous gray, palpi brown at sides, head and thorax else immaculate. Primaries black powdered, irrorate, the ordinary maculation confused and indefinite. Basal line black, interrupted, geminate, always marked on costa at least. T. a. line marked by a geminate black costal dot and very indefinite below this, but as a whole outwardly oblique. T. p. line geminate, inner line crenulate, not very well marked, outer line a series of venular dots variably distinct; as a whole its course very even. Beyond its middle the s. t. space begins to darken to the outer margin, the terminal space being much darker than ground color, almost blackish; through this dark space the s. t. line is distinct as a series of large pale spots not much paler than ordinary ground color. A series of black terminal spots; a vague indication of a basal dash. Claviform moderate, concolorous, black marked, but not completely defined. Orbicular oval, elongate, quite variable in size, black marked, then with a pale annulus, centre concolorous or very little darker than ground color. Reniform large, kidney shaped, very indefinitely and quite incompletely outlined; concolorous. In some specimens the cell is distinctly black before orbicular and between that and the reniform. Secondaries in the ♂ pearly white, in the ♀ darker, outwardly smoky, veins dark marked, fringes white. Beneath white, with black powderings, without lines in the ♂, with an incomplete outer line and discal spot to all wings in the ♀. Expands 1.38—1.52 inches: 34—38 mm.

Habitat.—N. W. British Columbia; 1 ♂ 2 ♀♀.

In all structural characters this insect is nearest to *obesula* m., but has not the plump, heavy look so striking in that species; the ground color here is paler and much more irregularly marked than in *obesula* where the dark atoms are regularly distributed. The antennæ are as in *muræmula* rather than *obesula*, the latter having them unusually heavy.

A. insertans sp. nov.—General color a rather sordid yellow. Head and palpi immaculate, collar with a distinct black central line above which the color is somewhat more dusky. Thorax with black scales intermixed, forming an incomplete line margining the patagiæ. Primaries with the median lines practically obsolete, the t. a. line traceable only by a single loop below the claviform and the t. p. line marked only by geminate costal dots. A basal black streak, to

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which is attached the loop-like claviform. The cell is black around and between the ordinary spots, which are connected; an unbroken black line margining both. Orbicular elongate, with a slightly darker core; a narrow spur extending to the reniform, which is moderate in size and kidney shaped. A black spot below reniform. The s. t. and terminal spaces are prominently marked by the four pale streaks so characteristic of the 4-*dentata* series of this genus; the black intermediate dashes distinct; no distinct s. t. line. Secondaries clear, pure white. Beneath white, somewhat powdery, without line or spot. Expands 1.32 inches; 33 mm.

Habitat.—British Columbia, Spencer's Bridge.

The type is a unique male from Mr. Neumoegen; easily distinguished from its allies in the 4-*dentata* group by the pure white secondaries, the united ordinary spots and elongate orbicular; a combination shared by no other species. The genitalia are of the bifurcate type usual in the group to which the species is referred.

Agrotis cogitans sp. nov.—General color ashen gray with a slight luteous tint. Head and thorax unicolorous; collar with a median transverse black line. Primaries in some specimens with fine blackish powderings, usually very even and smoothly colored without shadings or contrasts of any kind. Basal line in a fully marked specimen geminate, distinct on costa and traceable to the basal dash; in other specimens it is entirely obsolete. T. a. line geminate, the two lines equally distinct, strongly oblique outwardly and outcurved in the interspaces; sometimes almost entirely obsolete. T. p. line single, fine, crenulate, strongly outcurved over cell, and then almost parallel with the outer margin; in some specimens nearly obsolete, but generally traceable. S. t. line usually entirely wanting, rarely indicated by a vague dusky shading. A series of black terminal lunules. A distinct narrow longitudinal basal line to the t. a. line, beyond which the claviform is more or less indefinitely marked with a few black scales. Orbicular concolorous, slightly ovate, usually distinctly outlined in black sometimes with a preceding black line, sometimes with a narrow line connecting it with the reniform. The reniform is inwardly well defined by a curved black line, outwardly vague and indefinite, but usually traceable. Secondaries in the male pearly with a smoky tinge; in the female somewhat darker. Beneath white, powdery, with a variably distinct outer line and discal spot to all wings. Expands 1.50—1.75 inches; 38—44 mm.

Habitat.—California (Neumoegen).

Four specimens ♂ and ♀ are before me, no two of which are alike and which yet vary very slightly. The transverse lines are more or less obsolete and the concolorous ordinary spots with their narrow black outline and marking are somewhat variable in shape and in their relations to each other. In structural characters the species agrees with that section of the *pityochrous* group of which *hollemani* is a member. In type of marking there is a curious re-

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semblance to *clandestina*, but the coloration and wing form are quite different. The thoracic tufting is not distinct, but is well indicated, the vestiture being rather loose.

Agrotis atomaris sp. nov.—Head, thorax and primaries deep smoky or blackish brown. Palpi darker at sides, collar with a tip of luteous scales, thoracic crest with an admixture of hoary scales. Primaries with a luteous shading through the centre of the wing. All the maculation obscure, indistinct, yet all traceable. Basal line marked on costa only by a geminate black spot. T. a. line geminate, sometimes traceable through the cell, somewhat outcurved between veins and with a long outcurve below the internal vein. T. p. line geminate, marked on costa, evenly outcurved over reniform, inner line finely crenulate, outer scarcely marked, except by the slightly paler included shade. S. t. line paler, interrupted, sometimes almost obsolete. Claviform present, outlined in black. Orbicular round, moderate in size, very indistinctly outlined. Reniform rather large, normal in form, slightly more leaden black, not very definitely outlined. Secondaries (♂) pure white, a narrow dusky marginal line. Beneath white, powdery, with an interrupted outer line and discal spot to all wings. Expands 1.25 inches; 31—35 mm.

Habitat.—California (Neumoegen).

The structural characters refer this species to the *pitychrous* group, and most nearly to *velleripennis*. From this latter species our form differs in the somewhat lighter shade of the wings, rather more luteous than black, while the ordinary spots are not so neatly outlined, and the transverse maculation is rather more distinct. Three males are before me, all very much alike. There is a chance that this may eventually prove identical with *velleripennis*, but I doubt it.

Agrotis remota sp. nov.—General color a pale, carneous gray. Palpi blackish at sides, else head and thorax immaculate, concolorous. Primaries with a reddish suffusion apparent in the median space, and the terminal space dusky. Basal line geminate, distinct, brown. T. a. line geminate, incomplete, slightly outcurved in the interspaces. T. p. line indistinctly geminate, as a whole well exserted over the reniform and thence rather evenly oblique to the inner margin; inner part of line fine, crenulate, outer line represented by venular dots distinct only below vein 5. S. t. line indefinite, irregular, forming an outward curve on veins 3–5, and again near apex; relieved by the dark terminal space. Claviform small, concolorous, incompletely outlined. Ordinary spots paler ashen gray; orbicular outlined in black, oblique, somewhat irregular oval. Reniform large, kidney shaped, narrowly pale lined, incompletely outlined inferiorly, outwardly with a pale, more yellowish blotch. A very narrow, interrupted, terminal line. There is a slightly deeper shade of reddish between the ordinary spots, but nothing like a distinct dark shading. Secondaries soiled whitish, with a

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darker outer margin. Beneath, primaries fuscous, with paler powdery outer and costal border, Secondaries paler, powdery, with an incomplete outer line and a diffuse discal spot. Expands 1.40 inches; 35 mm.

Habitat.—Sierra Nevada, Cal. (McGlashan).

This species has all the essential characters of the *pitychrous* group, and is perhaps nearest to *choris*, but quite distinct from it. The maculation so far as the ordinary spots are concerned is more distinct than any other of the *pitychrous* group, and in that respect approaches somewhat the *tessellata* group, without, however, in the specimens before me raising any question of the proper group to which it should be referred. The genitalia of the male are in all essentials like those of *pitychrous*.

Agrotis annulipes sp. nov.—General color ashen-gray with a reddish shade, with blackish powderings. Palpi darker at sides, head somewhat pallid in front, collar with a very vague transverse line composed of dark powderings. Thorax evenly and not heavily powdered. Primaries with the dark powderings becoming more prominent outwardly, slightly suffusing the outer part of median space and becoming most prominent as a heavy smoky brown shade before the s. t. line; the terminal space dusky, but not so dark as the outer part of s. t. space. Basal line apparently single, brown, not very distinctly marked. T. a. line geminate, evenly outcurved, slightly irregular; the outer part of the line is distinct, brown, rather broad, the inner vague, not well marked superiorly, but easily traced through the lower part of its course. Median shade very distinct, brown, rather definitely limited, very nearly parallel with the t. a. line. T. p. line distinctly geminate, rather widely outcurved over reniform and slightly incurved below; inner line distinctly crenulate, outer line somewhat vague, except through costal region. S. t. line pale, somewhat diffuse and very even, starting from the pale apical space. Claviform wanting. Orbicular and reniform slightly paler, not outlined, very vague and indefinite, at first sight apparently wanting. Secondaries smoky whitish, somewhat iridescent. Beneath whitish, powdery; primaries darkest and with trace of an outer line; secondaries more powdery along costa and without outer line or discal spot. Expands 1.16 inches; 29 mm.

Habitat.—Oregon.

A very distinct species of which I have only one ♀ specimen in good condition. It has all the characters of the *messoria* group, and according to the tabular arrangement comes nearest to *brunneigera*. It is, however, decidely smaller than that species, and the color is more gray; the prominent median shade and the dusky terminal parts of the wing are distinctive. The tarsi are ringed with brown, the legs also of the same grayish white as the underside.

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Agrotis murdocki sp nov.—Head and thorax a rather bright yellowish red, almost ferruginous, without mark or spot. Primaries with basal and subterminal space of the same red brown color as thorax. Median space bright bluish gray, outwardly dark shaded. Terminal space dusky. Basal line faintly marked. T. a. line geminate, very even, with an even, rather small outward curve; inner line brown, outer line broader, black. T. p. line geminate, even, outwardly curved over reniform, slightly incurved beneath; inner line black, distinct, outer line indefinite, incomplete, brown. S. t. line marked by the contrast between the evenly dark terminal space and pale s. t. space, its course irregular. A dusky costal shade in s. t. space before apex, leaving a paler apical spot. A pale line at base of fringes Claviform wanting. Orbicular large, round concolorous, faintly outlined by a pale ring. Reniform large, kidney shaped, inferiorly dark filled, obscured by the median shade which crosses the spot and then runs rather diffusely and close to the t. p. line, darkening the outer part of median space. Cell between the spots also dusky. Secondaries whitish, soiled, with a faint reddish suffusion. Beneath pale, powdery, disc of primaries darker; an outer line and discal dot to all wings. Expands 1.20 inch.; 30 mm.

Habitat.—N. W. British Columbia, Utah Territory.

This very handsome species is readily recognized among its congeners by the strong contrast between the blue-gray median and reddish yellow or rusty red basal and s. t. spaces. It has all the characters of the *messoria* group, but is unique among them all. The specimen now before me is from Mr. Neumoegen. I received it some time since from Mr. Edwards, who had it, I think, from Utah. Some years since I received the first specimen from Capt. Murdock, Fort Thornburgh, Utah, and this specimen is now in the United States National Museum. From Capt. Murdock I received many good species, and it is matter for extreme regret that so good a collector in so fine a locality should have lost his life so soon.

Agrotis quinquelinea sp. nov.—General color fuscous gray. Head concolorous; collar with a central dusky line; thorax concolorous. Primaries evenly colored, the transverse lines blackish. Basal line distinct, single. T. a. line distinct, upright very slightly angulate; median shade line distinct, broad, very irregular. T. p. line single, narrow, crenulate, its course as a whole very nearly parallel to the outer margin. S. t. line consisting of a narrow dark shade line followed by some pale scales relieving and defining the same; an interrupted, very narrow terminal line. Secondaries and abdomen pale smoky fuscous. Claviform wanting, ordinary spots barely traceable, concolorous, reniform inwardly marked by a small black dot. Beneath pale, powdery fuscous, with an outer line and discal spot on all wings. Expands 1 40 inches; 35 mm.

Habitat.—Sierra Nevada, Cal. (McGlashan).

This simply marked species is allied in appearance to the Alpine forms *tristicula* or *fusca* with the characters referring it to the group *messoria* so far as they can be made out from the single female before

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with the latter of these species it is most nearly allied, being closest to the form described as *verticalis* by Mr. Grote. It differs essentially from this, however, in the shape of the ordinary spots, and especially in not having any contrast whatever between median and s. t. space—a marked feature in all the *declarata* forms. Judging from the number of specimens sent by Mr. McGlashan the species is not uncommon.

Types in coll. Rutgers College, coll. Hy. Edwards, and coll. U. S. National Museum.

Since the above was written I find two specimens referable to this species in Mr. Neumoegen's collection, marked California, without indication of special locality. In these the ground color is a luteous brown or reddish, with a faint gray shade over all, and the cell between the ordinary spots is more distinctly dusky. Otherwise the maculation is practically identical, and I cannot think that we have here a distinct species.

Agrotis tessellata Harr.

Several specimens were in the lot received from Mr. Edwards, all from the Sierra Nevada, Cal., and these I separated at first under the term *intrusa*. More careful comparisons and studies lead me to the belief that we have to do with a variety of *tessellata* merely, differing from the eastern form principally in a distinct reddish suffusion of the primaries, and an infusion of yellow into the secondaries. The cell between the ordinary spots is not so distinctly black in some specimens, and in these the median shade is somewhat more apparent, one specimen showing quite a strong resemblance to the *messoria* forms. The term *intrusa* may be used to denote this reddish powdered form with the ordinary spots pale and contrasting, the head and collar distinctly more reddish. The size and other characters resemble the type.

Specimens of this form labeled *intrusa* m. are in the coll. Rutgers College, coll. Hy. Edwards and coll. U. S. National Museum.

Agrotis spectanda sp. nov.—General color a rather bright luteous gray, with a glaucus tint over all. Head somewhat darker, with a considerable admixture of black scales. Inferior part of collar also dusky, limited by a distinct transverse black line, above which are white scales. The patagiæ are also somewhat darker and margined with black scales. Primaries very smooth in general color, the terminal space and costal portion of s. t. space darker, more powdery cell filled with black about the pale ordinary spots. Basal line black, geminate, distinct. T. a. line geminate, well marked on costa, incurved on costal vein,

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thence slightly oblique outwardly to internal vein and along outward curve below. T. p line geminate, outcurved over reniform, then nearly parallel with outer margin; inner line narrow, crenulate, distinct, outer line even, much less evident. S. t. line narrow, pale, sinuate, marked by the darker terminal space. A series of black terminal lunules and a yellow line at base of fringes. Claviform moderate in size, concolorous, distinctly outlined in black. Orbicular moderate in size, slightly irregular, but hardly oblique, distinctly black ringed, and with a very narrow border of pale scales; reniform moderate in size, of the normal form, with a paler central line. Secondaries (♀) white, the veins dark marked. Beneath white, primaries somewhat smoky and with a trace of an outer line. Expands 1.32 inches; 33 mm.

Habitat.—California (Neumoegen).

A single female only of this pretty and sharply defined species is at hand. It has all the appearance and structural peculiarities of the *tessellata* group; the white secondaries of the ♀ ally it with *pallipennis*, while the maculation of primaries is much more like *albipennis*, or even *declarata*. Some cleanly marked specimens of *tessellata* resemble this species, but the white secondaries are always distinctive. Had the specimen been a male the white secondaries would not have been so important, as the female may have dusky secondaries when those of the ♂ are white; the reverse, however, is never the case within my experience.

A. nostra sp. nov.—General color a somewhat luteous brown, varying a little in shade. Sides of palpi darker, the front sometimes with dark scales. Collar with a somewhat faintly marked median transverse line. Thoracic tuftings gray tipped, sometimes the entire thorax somewhat darker in shade than the ground color. Costal region powdered with gray, more broadly at base, terminal space blackish, not greatly contrasting, and somewhat variable in the amount of the dark shading; on apical blotch gray powdered. Basal line present, geminate, not well marked. T. a. line geminate, very slightly oblique, with a distinct outward curvature in the interspaces; the line is sometimes barely traceable, and the two parts are generally equally distinct. T. p. line nearly parallel with the outer margin, the inner line finely crenulated, outer line reduced to a row of small venular dots which are sometimes wanting; sometimes the entire line is scarcely traceable. S. t. line irregular, concolorous, marked only by the dusky terminal space and by a vague preceding shade; a series of small terminal lunules. Claviform indefinitely outlined, concolorous. Orbicular oval, of good size, black ringed, gray powdered; reniform large, kidney shaped, narrowly black ringed, concolorous or slightly paler, somewhat leaden filled inferiorly. The spots are always distinct, but somewhat variable in point of definition, sometimes incompletely outlined. The space between the spots is darker, but never black or prominent. One specimen shows a black spot preceding the orbicular, and another has the entire maculation obscured, the ground color paler than normal. Secondaries smoky fuscous, the veins

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close to what I have determined as *satis* Harvey, but differs in having no claviform, in lacking the gray powderings of primaries, in wanting the black defining lines to the ordinary spots, and in lacking the common transverse line of the underside; it is besides much larger than *satis*. From *rufula*, to which, also, it is allied, it differs in having the median space concolorous and the orbicular always complete. The species has all the structural characters of the *tessellata* group, and the ornamental characters are obvious in fully marked specimens; in those forms in which the cell is not at all darker between the spots confusion may result in an endeavor to place a single specimen from the synoptic table.

Types in the Rutgers College collection; coll. Hy. Edwards and coll. U. S. National Museum.

Agrotis basiflava sp. nov.—Deep dull luteous brown, with black powderings, varying to quite deep blackish brown. Collar concolorous, or sometimes head and collar paler, with a ferruginous tinge, and with a variably evident dark transverse line, less distinct in the pale specimen (♂), black in the dark specimen (♀). Primaries with basal space paler, the contrast most marked in the male. Basal line distinct, black, angulate, geminate. T. a. line distinct geminate, the inner line somewhat indistinct, but not obsolete, outer line black; the course very even and nearly upright from costa to internal vein, then with a long outward curve to inner margin. A faint diffuse and indefinite median shade from the dark shading between the ordinary spots. T. p. line evenly and not strongly curved over reniform, very slightly incurved below; the line is geminate, the inner crenulate, but not prominently so, the outer very even, included space concolorous, or (in the dark ♀) with ashen powdering. S t. space not discolorous, but apparently a very little paler, with a series of somewhat triangular dark spots preceding the narrow, indefinite, pale s. t. line, which is very slightly sinuate. A row of blackish terminal lunules. No basal dash or mark. The costa is slightly paler, but not at all discolored or contrasting. Claviform distinct, but small, black bordered Orbicular inwardly oblique, oval, not complete superiorly, black margined, slightly paler; reniform of fair size, kidney shaped, not complete inferiorly, black margined and with a paler annulus; of the same color as the orbicular. The cell is darker, but not distinctly black between the ordinary spots. Secondaries smoky, paler, more yellowish in the male. Beneath dark, smoky; primaries with an outer line marked on costal space only; secondaries paler discally, with a small discal spot and an outer line, beyond which the margin is darker. Expands 1.16—1.20 inches; 29--30 mm.

Habitat.—N. W. British Columbia (Neumoegen).

This species belongs to the *tessellata* group, and is a close ally of *satis* and *rufula*. From the former it differs by the lack of pale powderings, the incomplete orbicular, the spots not powdered with yellow; it is a darker, somewhat shorter winged species, with the cell more definitely dark filled. From *rufula* it differs in the darker

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color, and the lack of the distinct contrast between the median space and the basal and s. t. spaces. The orbicular is as in *rufula*, but the underside is much darker, with the maculation not marked.

Two specimens, ♂ and ♀ are before me, differing very decidedly in appearance. The male is paler, the maculation more distinct, and the pallor of the basal space is more evident. The female is darker throughout, the tendency along the costa and in the ordinary spots to a cinereous powdering, the contrast between basal and median space not well marked. The species is not a strongly marked one, but is distinct, I think; though most difficult to separate from the species above named, it really gives the impression, in the ♀ more especially, of *tessellata*. It cannot well be that species, however, variable as it is; the structural characters are like *tessellata* throughout.

Agrotis rena sp. nov.—General color varies from a very pale carneous gray to a distinct reddish gray, the change being rather one of intensity than color. Head and thorax immaculate, palpi dark at sides. Primaries with the maculation not strongly contrasting, transverse lines sometimes obsolete; in fully marked specimens basal line distinct, geminate, black; t. a. line very slightly outcurved, irregular, geminate, outer line blackish, broad, distinct, inner line faint and more even. T. p. line geminate, outer line punctiform, inner line narrow, crenulated, its course rather even, and not strongly outcurved over reniform; s. t. line pale, narrow, very slightly irregular, relieved by a distinct, dark, rather narrow, preceding shade. A narrow interrupted dark terminal line. This maculation may be wanting in part or entirely; one specimen lacks all but the merest trace of the t. p. line; usually the s. t. line remains distinct. Claviform small, incompletely outlined, in pale specimens entirely wanting. Orbicular large, round, slightly irregular, narrowly pale ringed, a black spot filling the space between orbicular and t. a. line, and another dusky shade filling the interval to the reniform the color of the included space is very slightly paler than ground color; reniform large, upright, kidney shaped, narrowly outlined in pale, with a leaden gray filling becoming blackish inferiorly. These ordinary spots are constant in the series examined though the distinctness varies, as does also the color of the filling between them. Secondaries soiled white to pale fuscous, the difference not sexual. Beneath, primaries fuscous powdery, pale at costa, with an outer transverse line visible only at costa, and a large discal spot; secondaries much paler, powdery, with a distinct outer shade line and large discal spot. Expands 1.25—1.32 inches; 31—33 mm.

Habitat.—Sierra Nevada, Cal. (McGlashan).

The series before me, by the kindness of Mr. Edwards, shows quite a long range of variation within comparatively narrow limits. There is little or no change in ground color nor in the relative position or course of the lines or spots, while the whole transverse maculation may be almost completely gone and only the ordinary spots remain. In structure it fully agrees with *tessellata* and *declarata*, and

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me. Front mucronate, anterior tibiæ armed, median shade distinct. Its closest ally is perhaps *incallida*, from which the simple lines separate it at a glance. The legs, too, are not banded as in the other species, and there are numerous other distinctive features.

Agrotis incallida sp. nov.—General color pale ashen gray. Palpi brown at sides; a dusky line across the front; collar dark tipped. Thorax unicolored, concolorous. Primaries with slightly darker suffusion beyond the median shade. Basal line geminate, black, upright, lunulate, the outer line broad, the inner narrower and fainter. A broad, black median shade, somewhat diffuse outwardly. T. p. line black, lunulate, geminate, the outer line distinct near costa only, a strong outcurve over the reniform and a slight incurve in the submedian interspace. S. t. line irregular, interrupted, pale, marked by a very distinct smoky preceding, and a somewhat less evident following shade. Claviform wanting, orbicular barely traceable, concolorous; reniform marked only by an indefinite dusky spot. Secondaries deep smoky brown. Beneath very dark smoky brown, with white powderings along the costa, broader on secondaries. A broad diffuse outer band, distinct only through the paler parts of the wing; secondaries with a discal spot. Vestiture of breast ash-gray, tarsi and tibiæ black ringed. Expands 1.5 inches; 37 mm.

Habitat.—Sierra Nevada, Cal.

The structural characters as far as they are ascertainable from the single female before me, are like the *messoria* group. The fore tibiæ are spinose, the clypeus is mucronate, and the maculation is like that of *extranea* and *trifasciata*, from which the color and the want of distinct ordinary spots separate this species. The appearance and habitus at first refer to *opipera*, *munis* and *dissona*, but all of these afford distinctive characters, leaving the color and general appearance responsible for the impression. It is perhaps closer to the Alpine *simplonia* than any of our own species.

Agrotis lutulenta sp. nov.—General color a luteous gray; sides of palpi dusky, a dusky line extending from the eyes to the base of primaries; head and thorax else immaculate. Primaries slightly blackish powdered, more distinct along the inner margin, and darkening the terminal and outer part of s. t. space. Basal line geminate, not well marked. T. a. line geminate, outwardly slightly oblique, moderately outcurved in the interspaces, a long outcurve below internal vein; inner part of line obsolete, outer very distinct. T. p. line narrow, crenulated, parallel with the outer margin, inferiorly becoming indefinite; outer part of line marked only near costa and not continued as a series of venular dots. Median shade indefinite, diffuse, best marked between the ordinary spots, and with some difficulty traceable below. Beyond the t. p. line the s. t. space darkens to the outer margin interrupted by the very fine, pale, irregular and partly obsolete s. t. line. No dark terminal line or lunules, a pale yellow line at base of fringes. Claviform wanting. Orbicular round, pale ringed, not prominent, scarcely even distinct. Reniform large, very vague, not outlined, marked by a yellowish curved line, which constitutes the outer margining line, and by a

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slight lateral extension of the median shade. Secondaries smoky fuscous, outwardly somewhat darker. Beneath paler, more whitish, powdery, with an outer line and discal spot on all wings; primaries with disc fuscous and outer line incomplete. Expands 1.37 inches; 34 mm.

Habitat.—Sierra Nevada, Cal. (McGlashan).

Very closely allied to *brunneigera* Grote, with which it agrees in all structural characters and in the ornamental characters determining its reference to the *messoria* group. It differs in the pale ground color, the greater size of the ordinary spots and the distinct outer shade combined with the partly obsolete s. t. line.

Types, a male in the Rutgers College collection; others in collection Hy. Edwards.

Agrotis alticola sp. nov.—General color a mixture of red and clay yellow, varying to a definite bright red-brown or deep brick-red. Collar with a dusky central line not apparent in dark specimens. Primaries always with a darker shade before the s. t. line, and usually the terminal space also is darker. In fully marked specimens the maculation is as follows: basal line geminate, indistinct, included space paler than ground color; t. a. line geminate, slightly oblique, strongly outcurved between veins, included space paler; t. p. line very even, parallel with outer margin, geminate, inner line crenulate, fine, included space pale, outer line vague, often wanting; from this point the s. t. space usually begins to darken to the pale s. t. line, which is very irregular, sinuate, outwardly curved over veins 3–4, and again over veins 6–8, intervening inward angle quite sharp. Claviform wanting; orbicular round, or a trifle oblique, pale ringed, with concolorous, or somewhat paler centre; reniform large, kidney shaped, pale ringed, incompletely outlined inferiorly, where it is somewhat dark filled, outwardly pale marked; the cell between the ordinary spots is usually darker, sometimes black, and in such case in pale specimens a distinct, dark, median shade crosses the wing from that patch. From this complete maculation the variation is in the direction of obsolescence; the basal and t. a. lines are the first to go; then the t. p. line becomes indistinct, and the pale included space alone is sometimes seen crossing the wing; then this goes and only the s. t. line remains, and this is evident in all the specimens: the darker preceding shade is also permanent, but variable in intensity, while the terminal space may be either darker, concolorous, with, or paler than the ground color. The ordinary spots are always traceable, but vary in the line of obsolescence. The most strongly modified specimen is dark brown-red, with all save the s. t. line lost, the preceding shade very slightly marked, ordinary spots concolorous, the pale defining line very narrow. Secondaries in the ♂ soiled whitish, with a narrow dusky outer border; in the ♀ fuscous. Beneath powdery, primaries more reddish, secondaries whitish, no outer transverse line secondaries without distinct discal spot. Expands 1.25—1.40 inches; 31—35 mm.

Habitat.—Sierra Nevada, Cal. (McGlashan).

A large series of this interesting species is before me showing what I hope is the entire range of variation of the species which is a difficult one to place in a table by reason of its variability. It is very

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darker, discal lunule of underside visible. Beneath powdery fuscous, with a discal spot on all wings, and a variably distinct outer line. In one specimen the line is wanting entirely. Expands 1.50—1.60 inches; 38—40 mm.

Habitat.—Sierra Nevada, Cal. (McGlashan).

This species is allied to *basalis* Grt. and *solitaria* Smith, having all the structural characters of the *tessellata* group. In superficial appearance it strongly resembles *saucia*, and I am very sure I have seen the species mixed with *saucia* in collections. The tuberculate front and the structure of the antennæ will serve to distinguish the present species at once. It has the wing form of *saucia* rather than *tessellata*, and by this character and the dusky terminal space bears some resemblance to the *cinereomaculata* form of *ochrogaster* Gu.

The species seems tolerably common judging from the number of specimens sent.

Types in the Rutgers College collection, coll. Hy. Edwards, and coll. U. S. National Museum. Mr. Neumoegen also has specimens in his collection.

Agrotis furtivus sp. nov.—Ground color varying from fuscous gray to bright red-brown. Head and thorax evenly concolorous, collar with a central black, transverse line. Primaries with costal space to t. p. line pale, discolorous, in the brown specimens most prominently so. Basal line wanting, at all events not traceable. T. a. line usually obsolete, in one well marked, brown specimen traceable as a pale, outwardly oblique line without definite margins, and angulate in the interspaces. T. p. line geminate, rather even, pale, outcurved over the cell and slightly incurved inferiorly; inner part of line usually distinct, outer part not well defined; in some specimens the line is not traceable below the costa. S. t. space darker costally, a distinct dark shade and a series of sagittate blackish spots preceding the narrow, pale, and slightly irregular s. t. line, terminal space darker than ground color. In a brown specimen with well marked t. p. line the s. t. is decidedly paler than the median space, and this is the case to a variable extent where the t. p. line is marked. A black basal dash interrupted by the t. a. line, the small loop-like claviform continuing the dash beyond the line; this spot is very variably distinct, but usually not completely outlined; cell around the ordinary spots dusky to black. Orbicular variable in shape, always open superiorly, V-shaped to oblong, oblique, the change being made by cutting the outer horn of the V; in color like the costal region; sometimes with a darker centre; reniform moderate in size, kidney shaped, white ringed, the centre concolorous with costa, or somewhat darker. Secondaries smoky fuscous, with a variably evident discal lunule. Beneath powdery, with a very variable, distinct, outer line, and a more uniformly defined discal spot to all wings. Expands 1.38—1.50 inches; 35—38 mm.

Habitat.—California (Neumoegen).

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Three very strongly dissimilar specimens, all females. The species is most nearly allied to *idahoensis*, differing principally in the very distinct shade containing still darker sagittate spots preceding the s. t. line, which is less dentate than in its ally. The variations have been indicated in the description. The structural characters are of the *tessellata* group.

Agrotis infelix sp. nov.—General color red-brown, varying in shade. Head and collar inferiorly either gray or yellow, with a ferruginous admixture, contrasting; a black transverse line across the middle of the collar limits the pale space superiorly, and above this line the collar is concolorous with thorax. Thoracic disc in the specimen even, concolorous; in another the entire color is darker, the tuftings are gray tipped, the patagiæ with gray powderings and margined with black. Primaries with costal region discolored yellow, with a ferruginous or an ash-gray powdering, gradually merging into the ground color before the inception of the t. p. line. Basal line whitish, loop-like, cutting a disk out of the basal black streak. T. a. line visible only in the s. t. interspace, where it crosses the black basal dash in the form of an outcurved pale line margined with deep black. T. p. line narrow, single, finely crenulated, slightly outcurved over reniform, thence very evenly parallel with the outer margin. This in the ♀; in the ♂ no trace of the line is visible. In the ♂ the color is even unbroken through the median and s. t. space to the s. t. line, which arises from a gray apical spot and is punctiform and very slightly irregular, the spots preceded by sagittate black dashes; beyond this line the narrow terminal space is slightly more dusky, and there is a row of small black terminal dots; in the ♀ a grayish suffusion along the black marked veins relieves and lightens the s. t. space, intensifies the black sagittate dashes and makes the terminal space darker by contrast; the maculation, otherwise, is as in the ♂, save that the s. t. line is more evident and some of the spots are connected, showing that the line is distinctly dentate on veins 3 and 4. Claviform distinctly black margined, variable in size and form, center concolorous, surmounted with an also variable pale, yellowish streak, crossing the median space. Orbicular oval, oblique, complete, black ringed, then with a pale annulus, centre of the color of costal region: reniform large, kidney shaped, contrasting yellowish, inferiorly dark grayish marked. In the ♀ the entire internal margin is gray marked. Secondaries evenly fuscous, with a row of terminal darker lunules, fringes paler. Expands 1.65—1.80 inches; 41—45 mm.

Habitat.—California (Neumoegen).

This handsome and well marked species comes nearest to *obeliscoides* in the *tessellata* group, but is perhaps more nearly allied to *perexcellens* of the *qudridentata* group. From the latter it is distinct by the lack of the prominent dentations of the s. t. line; from the former by its very much larger size, the more produced primaries, different s. t. line and other details of maculation. The line of va-

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riation is in the same direction as in *perexcellens*, the two specimens before me showing strong differences, while evidently referring to the same species.

Since the above was written I have seen a series in the United States National Museum which runs from the form above described to a uniform *black* the maculation scarcely identifiable. The series is bred, so there is no question as to the identity of the specimens.

Since the mss. of the above descriptions was handed in, I have deposited a series of types in the collection U. S. National Museum, which contains nearly all of the species above described. The collection now contains more than seventy-five per cent. of all the described species of *Agrotis*, and in generally finer series than any individual collection known to me.

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NEW SPECIES OF NORTH AMERICAN CYNIPIDÆ.

BY H. F. BASSETT.

The Cynipidæ described in the following pages are the accumulations of many years. They are, largely, the material sent me by correspondents from all parts of the United States, and I regret that circumstances have made it impossible for me to give earlier attention to their favors.

Besides the new species here described I have thirty or forty new species of galls, from which I have not yet succeeded in rearing any true gall-flies, many of them extremely interesting forms, but, except in one instance, I have left these to those naturalists who shall be so fortunate as to secure both the galls and their producers.

The reasons for the exception to what is, undoubtedly, the proper course, viz.,—not to describe a species from the gall alone—will appear in my monograph, the completion of which seems to myself not very far off.

I am not sure that the species here noticed are assigned to their proper genera in all cases, indeed, I think a few do not belong to any genus yet established, and for these provision must be made hereafter.

Although the recognized species in this country have increased from less than a dozen in 1862, when Baron Osten Sacken's "First Contribution to the History of the North American Cynipidæ," appeared, to more than two hundred, it is still too early to attempt a classification of our species that future discoveries shall not disturb.

Not until the relations of our agamous to their bi-sexual forms shall have been fully learned can such an undertaking give satisfactory results. For this reason I have abstained from genus making altogether, satisfied if my descriptions shall be found sufficiently full and accurate to be helpful in future studies of this interesting, but exceedingly difficult family.

RHODITES Hartig.

1. **R. lenticularis** n. sp.

Lentile-shaped galls in the parenchyma of the leaves of *Rosa lucida*, showing on both the upper and underside and from .10 to .15

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of an inch in horizontal, and .08 inch in vertical diameter. Comparatively few of the galls are single. Most are confluent and of irregular outline, and in some instances the entire leaf is covered, while in others the right or left lobe is thus covered. These galls resemble the European species *R. spinosissimæ*, but the latter are more nearly globular, and their vertical diameter is one-half more, while the horizontal is considerably less. The larval cell is much larger and the walls much thinner than in *R lenticularis*, and, as will be seen, the insects differ much.

Gall-flies.—Female.—*Head* black; antennæ short, first three joints very dark reddish brown, remainder dull black; first and second joints globular, third one-half longer than the fourth, fourth slightly longer than the succeeding ones, which are short and thick, and distinct. *Thorax* black; mesothorax dull, not shining, finely rugose, and with microscopic hairs; parapsidal grooves smooth, rather large and distinct, only faint traces of the intervening lines that are usually seen in this genus; pleuræ shining in the middle; scutellum very finely wrinkled or corrugated. *Abdomen* shining, deep yellowish red. *Legs* very dark reddish brown. *Wings* subhyaline, with an exceedingly faint reddish cloud on, and surrounding the radial area; in many specimens this cloud is scarcely discernible; veins slender, but distinct, second transverse, and those bounding the radial area largest; areolet always present, but a mere dot. Length of the body .08 inch.

♂.—*Wings* more nearly hyaline, and without any trace of cloudiness. Length .07 inch. (my only ♂ specimen is in poor condition)

Dr. Rudow states that the third antennal joint of *R. spinosissimæ* is three and a half times as long as the fourth. In *R. lenticularis* the third is only one and a half times as long as the fourth. *R. spinosissimæ* is larger and differs in other respects from *R. lenticularis*.

This species was discovered in eastern Massachusetts by Miss Cora H. Clarke, of Jamaica Plain. I am indebted to Miss Clarke not only for this, but for many other species of galls, several of which are new and will be described in this article.

2. **R. tumidus** n. sp.

GALLS.—These rose galls were received from Mr. A. H. Siler, who collected them in southern Utah, but from what species of wild rose I am not able to say. They are globular, and from three-fourths to one and one-fourth inches in diameter, and of the same spongy cellular consistence, internally, as *R. radicum* O. S. They appear to be enormously developed leaf buds, for the terminal half of many of them bears a faint resemblance to a half-opened rose, or a miniature cabbage, the lines on the surface being the outlines of leaves. They grow on the end of a woody stem, and are in most cases nearly sessile,

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though in a few the stem is half an inch long. The upper half of the gall is covered with a thin, white, papery epidermis, which is usually torn and curled by the rapid growth of the gall itself.

The true bark beneath is red or brown, and quite smooth in fresh galls, but wrinkled when they become dry. The apex of several galls is crowned with sharp spines and such are found on the base, and stem of others. It is plain that each gall is a foreshortened branch and the gall-fly must lay her eggs in it at an early stage of its development. These galls are polythalamous.

Gall-flies.—Male and female. ♀.—*Head* black; antennæ black. first joint ovate, second globose, third twice as long as the fourth, which slightly exceeds the remaining ones. *Thorax* black, finely and evenly rugose or wrinkled, shining rather than dull, parapsidal grooves very fine, two short parallel lines on the anterior half of mesonotum and a short median line on the posterior half of the same and a smooth, shining ridge over the base of each wing; pleuræ rough, scutellum evenly rough or rugose. *Abdomen* very dark reddish brown, approaching black. *Legs* the same color. *Wings* with a yellowish tinge throughout, but deeply clouded on the veins that bound the radial area, and indistinctly so beyond its apex; veins distinct, except that the slender cubitus is scarcely discernible at its union with the first transverse; areolet large, and the veins bounding it of equal size. Length of the body .12 inch.

♂.—Black, except the abdomen and legs; these are darker, however, than those of the female. *Wings* subhyaline, with no cloudiness, except that along the veins bounding the areolet and the radial area. The yellowish tinge that pervades the wings of the female appears here, and is rather more intense than in that sex. *Abdomen* very small. Length of the body .10 inch.

3. **R. variabilis** n. sp.

GALLS.—Irregularly rounded, sometimes ovate or reniform, and varying so much in form and size as to make a description difficult. They are from one-quarter to three-quarters of an inch in diameter in the more regular forms, but the reniform specimens often exceed an inch in diameter. Polythalamous, but evidently so through the perfect coalescence of two or more galls. The surface, like that of a russet apple and the color, nearly the same. Some, gathered perhaps before they were fully matured, are of a darker color, and are shrunken. These last may possibly prove to be a distinct species, but the insects offer no essential points of difference.

The development of these galls is as variable as their form. Some appear to grow on the ends of the small branches, others are attached to the leaf stems, while others are developed from an abortive leaflet, while still others grow on the surface of fully developed leaves. Internally, they are of a rather solid, pith-like substance, and the larvæ have no free larval cell.

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They were collected for me in southern Utah, in large numbers, by Mr. A. H. Siler.

Gall-flies of both sexes.—*Head* black, finely and evenly punctate on the vertex and with a few short microscopic hairs, broader than the narrow thorax; antennæ 14-jointed, first joint large and round, second also round, but very small, the third is more than twice as long as the two preceding taken together, the fourth one-half as long as the third, remaining joints are subequal; in the female the first and second joints yellowish brown, the rest dull black; in the male black throughout; in both sexes the antennæ are very slender, but those of the female are shorter. *Thorax* black, finely rugose and hairy like the head, though the hairs are longer, two smooth, parallel lines from the collar one-half way to the scutellum, and a very short median line from the scutellum that almost immediately disappears; the parapsidal grooves not smooth nor deep, converging rapidly as they approach the scutellum; scutellum small, rough and depressed at its junction with the mesonotum. *Legs:* coxæ dark, shining, lighter towards the femur; femur, tibia and tarsi dark yellowish brown; the legs of the male, especially the posterior pair, are considerably darker than those of the female. *Abdomen* of the female small, yellowish brown, darker towards the end, the first segment pedicillate, the second very long and nearly concealing the remaining ones; sheath of the ovipositor sharp pointed, as in all this genus; the *abdomen* of the male is very small and shining black. *Wings:* veins dark and heavy, cubitus very distinct and reaching quite to the first transverse; areolet medium size; radial area faintly clouded on the second transverse vein in the male, and more heavily clouded throughout in the female, except a small spot in the center; the cloudiness extends slightly beyond the apex of the radial area. Length: body male .10, female .11 inch.; wings, male .12, female .14 inch.

The description of the female does not apply to all the specimens of this sex reared from these galls, as in some the radial area has no cloud, but a simple broadening of the veins bounding it. As this difference is quite noticeable, and as the galls differ so much in form and size, I am inclined to believe that there may be here two distinct, but closely related species.

4. **R. Utahensis** n. sp.

Mr. Siler sent me from Utah, several years ago, some very large rose galls that did not differ, so far as I could see, from *R. radicum* O. S. It is true they were larger and less regular in form than that species and showed more plainly that they originated in a leaf bud. The largest specimen was three inches in diameter, and one or two others were nearly as large. They appeared to have grown near the surface of the ground, but not under moss or fallen leaves, as is the habit of *R. radicum.*

They were old galls and I reared nothing from them, but on cutting them open I found several perfect insects, evidently *Rhodites,*

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and all of the male sex. The females seemed to have made their way out. On comparing them with the males of *R. radicum* I found them to agree so closely that I was disposed to look upon them as merely a variety of that species. Further study revealed some minor differences, and at least one characteristic that seemed to entitle them to rank as a distinct species.

The differences noted are as follows: the first joints of the antennæ are not as dark reddish brown as in *R. radicum*, the antennæ are not as long, the mesothorax is shining punctate, the punctuation much finer, the feet are not as dark, and, while the wings are possibly a shade deeper yellow, the clouded spots seen on the wings of *R. radicum* are wanting, and the enlargement of the second transverse vein at the base of the radial area in that species is wanting in this. But the most notable difference is, that while the parapsidal grooves in *R. radicum* almost touch each other at the posterior margin of the mesothorax, they are so widely apart in this species that the difference cannot escape notice.

There are species in this genus that resemble each other more nearly than these two, but in such cases the galls are very distinct. If further observations show it to be only a variety it is sufficiently marked to deserve a name.

5. **R. nebulosus** n. sp.

Round, hollow, thin shelled, monothalamous galls three-sixteenths of an inch, or less, in diameter, on the underside of the leaves of the wild rose (*Rosa blanda* and probably *R. carolina*). They are usually situated on the lateral veins on the lower half of the leaf and close to the mid-vein. The surface in the green galls is quite smooth, but when dry it is slightly rough and uneven, but not pubescent. There is no larval cell.

These galls are often parasitized, and such are sometimes quite solid and contain several larval chambers. The same often occurs in galls of *R. bicolor*. I have received this species from correspondents in widely separated sections, but in most cases the galls were immature when collected and produced nothing, and I have only one gall-fly, a male, of this species.

Gall-flies.—*Head* black, very broad, front from the eyes and including the base of the antennæ, perfectly flat; ocelli prominent, and included in a smooth, shining space bounded by a distinctly impressed line, outside of this space the vertex is hairy and finely reticulated; antennæ 14-jointed; joints one and two deep brownish yellow, remaining joints black, third twice as long as the first

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and second taken together. *Thorax* black, covered with fine, short hairs, evenly punctate, parallel lines distinct and reaching half way to the scutellum; parapsidal grooves distinct and reaching three-fourths of the way to the collare; lines over the base of the wings distinct and closely approaching the parapsides anteriorly; scutellum rugose, and with fine short hairs: no foveæ, but a straight, prominent, transverse ridge separates the scutellum from the mesonotum. *Abdomen* clear, semi-translucent brown, but unevenly shaded. *Legs* pale brown, almost yellow. *Wings* heavily, but unevenly clouded, and with a small clear spot in the middle of the radial area; veins heavy, dark brown, almost black; areolet large, distinct; radial area open, or but partially closed. Length: body, .11 inch.; wings, .11 inch.; antennæ, .09 inch.

HOLCASPIS Mayr.

1. **H. duricoria** n. sp.

GALLS.—Globular, but less regularly so than *H. globulus* Fitch; sessile and subclasping on the young branches of *Q. bicolor*. The flattened base and the cone-like form of many of these galls remind one of the Minnie rifle ball. They are often so crowded that they become strangely misshapen; the surface is finely pulverulent, and when dry it is very hard. This suggested the trivial name. Internally the substance is similar to, but much harder than that of *H. globulus*. The larval cell is free in a small, irregular cavity; the galls average one-half inch in diameter, and the oval larval cell is one-eighth by three-sixteenths inches.

They are sometimes found in countless numbers on a single tree and for a single season, and then nearly or quite disappear. A few galls of this species appeared several years ago on a large and thrifty oak (*Q. bicolor*), which is growing in the yard of one of my neighbors. The next year the tree was covered with them; there were bushels of them, but the year following there were few, if any, new galls, but this year they have appeared again in considerable numbers. In this instance, and a few others, I have noticed that the tree seemed to be quite seriously injured by them. It is well known that this species has a large number of parasitic enemies, else it might prove very destructive to this species of oak. It has other foes besides insect parasites.

This is an agamous species, and I flattered myself that the tree in my neighbor's yard would give me an excellent opportunity to study the habits of these female flies as they left the galls, which they do in October and November.

I went day after day to look for them, but found only now and then one on the palings of the fence enclosing the yard. At length

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I discovered that several English sparrows and other small birds of different species had taken possession of the tree and were devouring the insects as fast as they appeared. I saw a species of creeper peer into a cluster of galls and seize a fly before it was out of the gall. Of course my effort amounted to nothing, and the mystery around the second generation remains, so far as I know, still unsolved.

That birds peck open galls of various species for the larvæ they contain is well known to every entomologist.

Gall-flies.—Entire body black. *Antennæ* with 13 joints, first joint large, second round, third nearly one-half longer than the two preceding taken together; third to the ninth gradually shorter, and each larger at the apex than at the base. *Thorax* hairy, two parallel lines from the collare to the middle of the mesonotum smooth; median line begins on the border of the scutellum, but soon disappears; parapsidal grooves heavy at their origin on the scutellum, but disappearing before reaching the collare; line above the base of the wings well marked, deepest at the scutellum; scutellum hairy, foveæ wanting. *Wings* slightly smoky, areolet present, cubitus disappearing before reaching the first transverse vein; second transverse heavy, especially at the base of the open radial area. *Legs* very dark brownish red, ungues two toothed. *Abdomen* black, shining, the first segment extremely short, making the second appear sessile on the metathorax; the sides of the second are covered with hairs, but there is a narrow, hairless line on the dorsum; the third and fourth segments are separated by a fine line from each other and from the second. Length: body, .19 inch.; antennæ, .13 inch.; wings, .25 inch.

Though this species has long borne the above name, given by me as a manuscript designation, it has not till now been published. Intending at the time to publish immediately, I sent specimens to several entomologists in this country and Europe; also sent photographs to some of my friends. I had at the time a full description of the gall and fly written, but while holding it to send with other matter for publication a brief notice of a similar gall found in the West appeared in the first volume of the "American Entomologist." Dr. Walsh, who wrote the paper, did not describe the species fully, but said that it was found on the Burr oak, and that it differed in several particulars from *C. globulus* Harris. His brief description led me to think that his and mine might be identical, even though they grew on different species of oak, and I determined to withhold mine till I could settle the question. The death of Dr. Walsh not very long after, and later still the destruction of his collections in the great Chicago fire, has made the settlement of the question difficult, if not impossible. If at any time their identity is established his published name has priority, and I yield to the rule in such cases most cheerfully.

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2. **H. corallinus** n. sp.

Galls received from Mrs. E. H. King, of Napa City, Cal. The first lot received were old galls from which the insects had escaped; they were black, but fresh ones are of a fine reddish buff color; they are attached to the small twigs of one of the varieties of dwarf oak and are perfectly round, but the surface is irregularly and thickly studded all over with short, stumpy projections which differ in size, and that are as large or even larger at the summit than at the base. There is usually a slight depression at the end. These remind one of certain species of coral. The surface, projections and all, is covered with a hard, close, velvety pubescence, if anything so closely appressed can be called velvety; the single larval cell is not free; the substance of the gall bright shining yellowish brown; the size is nearly three-fourths of an inch in diameter. The size and the blunt horns remind one of *A. speciosus* Bass., but that species is smooth, and the galls are found on the leaves only.

The insects from which the following description was made were cut from the galls from which they had nearly eaten their way out; they are all females.

Gall-flies.—Entire body, except a small spot on the dorsal ridge of the abdomen, thickly covered with short silvery white hairs, those of the antennæ and the middle of the pleuræ shorter and less conspicuous. Color, except the brownish black antennæ, reddish brown. *Head* a shade lighter than the thorax, which is itself less dark than the abdomen. *Antennæ:* first joint of the 14-jointed antennæ oblong-oval and only a little darker than the head; second joint very small and round, third one-fourth longer than the two preceding taken together, fourth a little longer than the first and second; remaining ones gradually shorter to the last, which is twice as long as the thirteenth; it has an indistinct annulation, which might be taken for a true joint. Lines on the *mesothorax* darker than the general surface; two closely contiguous, smooth, parallel lines from the collare half way to the scutellum; parapsidal grooves very widely separated at their origin on the scutellum, shallow and almost hidden by the appressed hairs and wholly disappearing before reaching the middle of the mesonotum; *scutellum* rounded, foveæ wanting. *Abdomen* more densely hairy than any other part of the body and the hairiness extends to all the joints that are visible. Color of the *legs* somewhat lighter than the body; ungues one toothed. *Wings* hairy, veins dark, but not heavy; areolet small, cubitus not quite reaching the first transverse; radial area open, basal vein angulated. Length: body, .16 inch.; wings, .18 inch.; antennæ, .10 inch.

3. **H. canescens** n. sp.

On one of the oak branches sent by Mrs. King, which bore several galls of *H. corallinus* just described, was a short branchlet on which were four or five galls of another species.

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The fully grown galls are round and measure three-eighths of an inch in diameter, and each has a short, blunt spur at the apex precisely like that of *H. duricoria* Bass., and they might easily be taken for dwarf specimens of that species, though the surface is more hoary. The larval cell is, in these specimens, attached to the gall, but can be detached without breaking. The body of the gall is hard, and around the cell there is a thin even layer of rusty brown, and outside this a light gray color prevails.

Opening three of the galls I found in each a full grown female gall fly that had failed to make its way through the hard wall enclosing it.

The description of *H. corallinus*, just given, applies to this species, except as follows:

The thorax and legs are somewhat darker and less hirsute, and the latter are of a clear, shining, almost resinous appearance. The abdomen is black and shining, with a tinge of brown, and the hairiness is confined to the sides of the second, third and fourth segments, and is so very sparse, short and fine, as to escape observation unless highly magnified, while the hirsuteness of *H. corallinus* gives it a hoary appearance even to the naked eye. The parallel lines on the mesothorax are more widely separated, and these with the line over the base of each wing are darker, broader and more shining, and, by contrast with the general surface, appear black. The parapsidal grooves, inconspicuous in *H. corallinus* are still more so in this and would easily escape notice. The wings differ mainly in the radial area, which is much larger in this species. Length: body, .15 inch.; wings, .20 inch.; antennæ, .13 inch.

4. **H. Sileri** n. sp.

Galls ovate from a broad base, sessile on the twigs of an oak growing in southern Utah, sometimes elongated at the point but not beaked, shining brown, yet not quite smooth. Many specimens are deeply and irregularly cracked, and from some the epidermis has flaked off. They rarely exceed one-fourth of an inch in diameter, and many are a little less than that. Internally they are harder than *H. duricoria*, *H. globulus* and *H. rugosus*, which they resemble, except that they are smaller. The larval cell is closely imbeded, but separable from the gall.

I have reared no gall-flies from these, but have found, on cutting some of them open, several apparently mature female specimens.

Gall-flies.—Dull dusky, reddish brown, except the abdomen, which is black and shining. *Antennæ* 14-jointed, first short, second very small, third and fourth moderately long and equal, the remaining gradually shorter, except the last, which is one-third longer than the preceding. Entire *thorax* moderately hairy, parapsidal grooves from the scutellum half way to the collare diverging; parallel lines from collare a little more than half way to the scutellum distinct and smooth

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a very deep line over the base of each wing and a short median line from the scutellum, which does not reach forward to the parallel lines just mentioned; foveæ wanting. *Abdomen* black, the second segment with hairs on the sides. *Legs* dark reddish brown, the tarsi darker and rather dusky, ungues two toothed. *Wings* large, hyaline; veins slender, dark; areolet small, cubitus only reaching two-thirds the way to the first transverse, radial area open and of usual size.

I do not give measurements of this species as the flies were not naturally developed, but they are probably about the same size as *H. corallinus* and *H. canescens*. The naturally hatched insects may vary somewhat from this description, but the galls are sufficiently distinct to establish this as a new species. I give it the name of the discoverer, A. H. Siler.

5. **H. perniciosus** n. sp.

Monothalamous, roundish galls, sessile by a broad base on the twigs of a dwarf oak growing in southern Utah. Apex in some specimens slightly elongated and compressed laterally, but usually blunt cone shaped. The twig itself is enlarged into a shallow cup-like receptacle at the base of the gall. In all my specimens (dry ones from which the insects have escaped) the galls are smooth, or only slightly rough, and with deep, irregular cracks and a dark reddish brown color. The large larval cell is firmly imbedded in the rather hard cellular tissue. The insects escape through a large opening which they make near the base of the gall. These galls bear a pretty close resemblance to the parasitized galls of *H. duricoria* Bass. Judging from their abundance on the twigs sent me they must be quite injurious to the trees infested. Cutting open several of the unperforated galls, I was so fortunate as to find several dead, but perfectly developed gall-flies, all females.

Gall-flies.—*Head* deep dusky red, face dark, almost black in the centre; vertex with a broad dark band in the middle enclosing the ocelli and extending to the base of the antennæ. *Antennæ* brownish black, shining; first joint large, second ovate, third slender and a little longer than the first two taken together, fourth, fifth, sixth and seventh gradually shorter, remaining joints of uniform length. *Thorax* dark reddish brown; in a strong light appearing black and covered with white hairs; surface punctulate, parallel lines broad, reaching half way to the scutellum; median line very fine and indistinct, parapsidal grooves distinct on the scutellum, but disappearing half way to the collare. Lines over the base of the wings distinct, close to and parallel with the parapsidal grooves; scutellum light red, hairy, regularly rounded posteriorly, foveæ wanting. *Abdomen* black and shining, first segment large, the sides sparsely covered with rather long, white hairs; sheath of the ovipositor with fine short hairs. *Legs* dark reddish brown, paler at the joints, the ungues black, simple. *Wings* hyaline, veins dark reddish brown, shining; areolet rather large, distinct; cubitus slender, and disappearing half way to the first transverse, radial area open. Length: body, .14 inch.; wings and antennæ medium length, not measured.

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DRYOPHANTA Forster.

1. **D. Clarkei** n. sp.

GALLS.—Small, round, smooth, and not quite three-sixteenths of an inch in diameter. They are formed of the buds of the white oak, and are filled with larvæ, which are separated from each other by very thin, filmy walls. Most of those in my collection are transformed terminal buds, but a few are axillary. I have not learned whether their development takes place wholly in the spring, or whether, like several other vernal species, they are partially developed in the preceding year.

The insects, which appear early in the spring, are of both sexes, and are described as follows:

Gall-flies.—Females.—*Head* and entire thorax black and shining; antennæ with thirteen joints, first short, dark, shining, almost black; second lighter color, short, almost spherical; third short, but nearly as long as the first two taken together; this and the following three light yellowish brown; remaining joints short and dusky brown. *Thorax* perfectly smooth, parapsidal grooves heavy, as are also the lines over the base of the wings; polished and shining. Scutellum also smooth, foveæ very small. *Legs* dark, shining brown, paler at the joints. *Wings* hyaline, veins moderately heavy, areolet a mere point; cubitus pale, decreasing in size as it approaches the first transverse, which it does not quite reach; radial area open. *Abdomen* black, short, terminal segments mostly concealed in the second.

Male.—Antennæ with fifteen joints, first black, second globular, third rather short, curved and incised; legs lighter than those of the female; abdomen very small; in size the sexes vary little. Length .08 inch.; wings, .09 inch.

This fine species was sent me last spring by Miss Cora A. Clarke, from eastern Massachusetts.

2. **D. pumiliventris** n. sp.

I find this remarkable species among my unnamed galls where it has lain for many years. I know nothing of its history further than the description of the galls and insects here given.

I have received through the mails many boxes of galls that bore no clue to the source from whence they came, or even to the tree or plant on which they grew. Most of them were well-known species, and their source was of comparatively small importance. I think this species must have come in this way.

These galls, now shrunken and distorted, are probably green, soft and succulent when fresh. They grow in clusters in the axils of the leaves, and when fresh may have been as large as a chestnut or a hazel nut. They seem to have varied considerably in size and form.

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They are polythalamous, and there are no true larval cells that I can discover. The species of oak on which they grew, for it was undoubtedly an oak, is not known. But while a good description of the galls is impossible from the material I have in hand; the insects possess very marked specific characters. I have forty-seven specimens of this species, and, strange to say, they are all males! They are described as follows:

Gall-flies.—*Head* yellowish brown to dark yellowish brown; vertex is somewhat rugose, ocelli very pale yellow; antennæ somewhat darker than the head, 15-jointed, the first and second of moderate length, the third very long, slightly curved and incised, the remaining joints long and all very slender; the cheeks are grooved; the thorax, and, indeed, the whole body, shining yellowish brown, but varying considerably in intensity in different parts and also in the same parts in different specimens. *Thorax* narrow and elevated in the middle, and with deep parapsidal grooves that converge towards the scutellum; pleuræ darker than the mesonotum and less shining; scutellum finely rugose, opaque, foveæ small, smooth, shining and widely separated. *Legs* reddish rather than yellowish brown, and nearly uniforn in color. *Abdomen:* first segment very long, slender and arcuate, like the first segment in most of the petiolated Braconidæ; second segment very small, triangular, the acute angle joined to the first segment, compressed laterally, and, small as it is, almost or quite covering the remaining segments; it is smooth and shining, and in some specimens the dorsal portion is indented, though this may be accidental. *Wings* very large, hyaline, the veins not heavy and rather pale; areolet small, but distinct, the second transverse vein bent in the base of the radial area, but without the stump of a vein; radial area open, long, but of medium width; cubitus very slender and nearly colorless. Length: body, .12 inch.; abdomen, .05 inch.; wings .20 inch.; antennæ, .20 inch.

The pale ocelli, the extremely long antennæ, the large wings, the long pedicel, and the extremely small remaining segments of the abdomen, all these taken together mark this as a very distinct species that, when its history is better known, may form the type of a new genus.

3. **D. eburneus** n. sp.

GALLS round, smooth, polished, resembling old ivory. They are from one-eighth to three-sixteenths of an inch in diameter, growing in great numbers on both the upper and under surface of oak leaves of a species I have not yet determined. The galls were sent me by A. H. Siler from southern Utah. Sometimes the galls are so crowded that they lose their globular form. They are strongly attached to the leaves and the base of the gall is usually grooved by the vein on which it grows. There are often twenty or thirty galls on a single leaf, one-third of which will be on the underside. They are hard

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and rather thick shelled and filled with fine silvery white hairs that radiate from the single larval cell that is attached to the base of the gall.

From several thousand galls I have reared less than fifty gall-flies. These are all females, and are described as follows:

Gall-flies.—*Head* black, face and vertex finely punctate, and with a few microscopic hairs; antennæ stout, fourteen joints, first thick, second less thick and only two-thirds as long, third fully as long as the two preceding taken together, fourth one-half as long as the third, the remaining ones short, all black and with short, inconspicuous hairs. *Thorax* black, mesonotum polished and shining, except the very distinct parapsidal grooves and a small hairy spot in front of the base of each wing; scutellum opaque, rough, foveæ present, rough like the rest of the scutellum. *Abdomen* bright, shining black. *Legs* black, with very dark, brownish red joints, the whole having, in a certain light, a reddish hue; ungues simple. *Wings* large, hyaline; veins slender, the areolet very small, the cubitus colorless the entire length, the radial area long, open and quite narrow. Length: body, .10 inch.; antennæ, .10 inch.; wings, .18 inch.

4. **D. similis** n. sp.

Galls received from Mr. Siler and collected by him in southern Utah. They are in all respects, save color, like those of *A. eburneus* Bass., but the color is a shining brownish buff. They are found on a different species (or variety) of oak.

The gall-flies also resemble *A. eburneus*, but are much smaller, the body being only .08 inch., the wings .12 inch. and the antennæ .07 inch. in length, and the cubital vein in the lower half is subobsolete.

A large number of specimens may show this to be only a variety, but the difference in the length of the wings and the antennæ, if constant, seems too great to be merely varietal. There may be seasonal differences, but as to this I am not informed.

5. **D. corrugis** n. sp.

Among a hundred or more of gall-flies captured last spring, while in the act of ovipositing in the buds of several species of oaks, were several distinct species, and one of these taken from the buds of Q. prinoides, produced, so far as my observations went, no galls whatever, none being found in any of the several visits I made these bushes during the summer.

Since the discovery, last spring, by Miss Cora A. Clarke of two new species,—*Andricus Clarkei* and *A. pulchra*, and of *Neuroterus pallidus* by myself, all on the aments of different species of oak, I have come to the conclusion that the insects in question are the agamous females of another bisexual species that comes from galls on

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the sterile flowers of Q. prinoides, and that I failed to find the galls simply because I did not revisit the trees until the flowers had fallen off. Of course this cannot be ascertained till next spring, and possibly not then, but meantime I name and describe this very pretty little species, of which I have sixteen individuals.

Gall-flies.—*Head* black, and with extremely fine reticulations; antennæ with fourteen joints, first heavy, club shaped: second thicker than the first and almost equal in length, third two-thirds as long as the first two and extremely slender, fourth short and slender; all these light yellowish brown, fifth yellowish to dark brown at the tip, a little thicker than the fourth, remaining joints very dark brown, very short and thick, the thirteenth and fourteenth separated by an indistinct articulation, and the thirteenth not so dark brown as the preceding. *Thorax* narrow, smooth and shining, parallel lines present, parapsidal grooves narrow, not shining; all these are quite slender; general surface of the mesonotum finely, evenly and very beautifully transversely wrinkled; scutellum rather large, more finely wrinkled than the mesonotum and less shining, foveæ wanting. *Abdomen* black, polished, subdepressed, second segment rather long, third one-half as long as the second, others concealed in the dry specimens. *Legs:* femur and tibia dark brown, except the joints, which, with the coxæ and tarsi, are yellowish brown, ungues simple. *Wings* hyaline, veins pale yellow, almost colorless; areolet absent, and the cubitus so indistinct as to be traced with difficulty even half way to the first transverse; radial area large, open; second transverse does not reach quite to the anterior edge of the wing and posteriorly extends no further than the point where the areolet is found in most species. Length: body, .10 inch.; wings .10 inch.; antennæ. .08 inch.

6. **D. pedunculata** n. sp.

Galls growing on slender peduncles on the edge of the leaves of Q. rubra and Q. coccinea. The peduncles are from one-fourth to one-half an inch in length and are plainly the prolongation of lateral leaf veins. They are usually flattened, and in some cases bordered on one side for nearly the whole length with a very narrow extension of the leaf blade itself. When dry they are often twisted like the stems of the moss Funaria hygrometrica. The gall is ovate, with a long, curved point. It measures one-eighth by three-sixteenths of an inch exclusive of the tip. When fresh it is smooth, and has a somewhat glaucus hue, which mostly disappears in drying, changing to a dark, dirty olive-brown. It is extremely thin, and is hollow, except the free, smooth, oval larval cell. This cell is .05 by .10 of an inch, and is extremely fragile.

This gall differs from *Andricus capsula* Bass. in size, being much larger, and in shape the latter being as long, but only half as thick, and also in color, which in either species is constant. But the free larval cell in *D. pedunculata*, and its entire absence in *A. capsula* is the most striking difference.

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Gall-flies.—*Head* black, vertex minutely rugulose; antennæ 14-jointed, first and second equal, and very pale yellow, third a little longer than the two preceding, slender; fourth equal to the first and second, the fourth brownish at the tip, and the remaining joints dark brown, and of equal length. *Thorax* smooth (microscopically punctate) black, shining, parallel lines obscure, parapsides distinct, but slender; scutellum small, obscurely punctate, foveæ very small and indistinct. *Abdomen* bright shining black, second segment very large, others (in dry specimens) concealed by the second. *Legs* yellowish brown, middle of the femur darker; claws simple. *Wings* hyaline, veins slender, dull brownish yellow; areolet small, cubitus reaching nearly to the first transverse, radial area long, open. Length: body, .08 inch.; .11 inch.; antennæ, .07 inch.

Male.—Antennæ 15-jointed, first joint dark at the base, second yellow, globular; base of the third, yellow; tip thickened, and with the remaining dusky brown; head, thorax and abdomen black; legs slightly darker than the female; abdomen small. Length: body, .09 inch.; .11 inch.; antennæ, .09 inch.

ANDRICUS Hartig (subgenus CALLIRHYTIS).

1. **A. (Callirhytis) pulchra** n. sp.

Galls on the aments of Q. tinctoria (also Q. rubra), when dry, shrunken and shrivelled, and measuring from .10 to .15 of an inch in diameter. They are polythalamous, each gall producing four or five insects. The interior of the gall is of a very loose spongy texture and the outside, thin and papery and green like the leaves. When fresh they are round and the size of a common red currant. They differ from the galls of *Dryophanta palustris* O. S., which is sometimes found on the aments of Q. ilicifolia, in the thin and smooth shell, and in being polythalamous. Flies of both sexes, appearing in May.

Gall-flies.—Female.—*Head* and thorax black, and evenly punctate, except the scutellum, which is evenly rugose; antennæ 14-jointed, the first short, thick; the second short, oval; third slender, one-fourth longer than the two preceding taken together, remaining gradually shorter; all connate, but alike distinct, and with a yellowish almost, metallic hue; cheeks grooved. Collare very broad; mesothorax rounded, median line a slight depression, but punctate like the rest of the surface, parallel lines rather broad and shallow, polished; parapsidal furrows very fine and extending throughout; lines over the base of the wings present, but indistinct; scutellum evenly rugose, foveæ near together and rather deep, and ovally elongated. *Legs* very dark brown, joints a shade lighter, ungues simple. *Wings* hyaline, veins colorless, except the subcostal and transverse, which are dark, but not black; areolet wanting, radial area open. Length: body, .08 inch.; wings, .08 inch.; antennæ, .07 inch.

Male.—*Antennæ* 15-jointed; first short, black; second short, ovate; third longer than the first two, and slightly curved and incised; all, except the first, with the yellowish metallic hue noticed in the female. *Abdomen* very small. *Legs* several shades lighter than those of the female, the posterior pair darkest; the somewhat longer antennæ and the smaller abdomen are usual in this sex, and, except as above, the two are quite alike.

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About one-half of my fifty or sixty specimens are males.

Galls received from Miss Cora A. Clarke, Jamaica Plain, Mass. I have galls, probably identical, which I found on the aments of the red oak many years ago in Florida, Mass., but I did not succeed in rearing insects from them.

2. **A. (Callirhytis) pusulatoides** n. sp.

Blister-like galls on the points of the acute lobes of the leaves of Q. coccinea, each tipped with the long hair-like point that terminates each lobe. They are ovate-acuminate, and look as if a bubble of air had separated the upper and under lamina of the leaf. They are about one-third by one-fifth of an inch in diameter, sometimes a little depressed vertically. The walls are very thin, the color the same as the leaf. Each contains a free, oblong-oval, thin walled larval cell, whose length is fully twice its diameter. The free larval cell of *Dryophanta palustris*, the only species with which this can be confounded, is perfectly round, and the gall is larger, thicker, and rarely found in the same position.

Gall-flies.—Female.—Entire body shining black. *Head* small; antennæ 14-jointed; first, second and third yellowish brown, remaining changing gradually to dull, dusky brown; first and second joints short, third equal to the preceding, the rest of uniform length. *Thorax* smooth, median line heavy on the scutellum, short; parapsidal grooves very distinct, converging closely on the scutellum; scutellum finely and evenly rugose, foveæ distinct, longer than broad, not deep. *Abdomen* polished, second segment large, deep, and nearly concealing the remaining ones. *Legs:* trochanters black, or dark brown, the remaining joints clear, dark brownish yellow, the posterior pair darkest, ungues simple. *Wings* of moderate size, subfuscous, veins strong and distinct, areolet wanting, the cubitus reaches a little more than half way to the first transverse vein; radial area open, and the veins bounding it of equal size throughout. Length: body, .10 inch.; wings, .10 inch.; antennæ, .08 inch.

This is not a common species, though I have met with a few individuals nearly every year for many years past. They are the prey of parasites to such an extent that I have never reared more than two or three true gall-flies, and I have now but a single female fly, of whose identity I am sure, and from which the above description is made.

3. **A. (Callirhytis) reticulata** n. sp.

Polythalamous galls on the midvein and near the base of small oak leaves from what is probably one of the dwarf varieties of Q. virens. Prominent on both surfaces, but more so on the underside. They are almost round and (dried specimens) one-fourth of an inch

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in diameter. The dry galls are exceedingly hard, and they bear a very close resemblance to those of *A. cicatricula*, though the scar or indentation invariably found in that species is wanting. The larval cells are not separable from the solid woody fibre around them, and they all radiate from a common centre.

My galls, collected by Mr. Howerton in New Mexico, have produced no males, but I do not look upon this as an agamous species.

Gall-flies.—Female.—*Head* and thorax very dark, brownish red, approaching black; antennæ short, 13-jointed, the first and second joints rather small and short, third hardly longer than the two preceding taken together, fourth not quite as long as the third, fifth to the twelfth subequal, thirteenth one-fourth longer and showing in a favorable light a dark ring near the tip hardly distinct enough to be called a suture; mesothorax with an exceedingly fine reticulation and a few short, scattered hairs, parallel lines reach half way from the collare to the scutellum, these and the parapsidal grooves and the short lines over the base of the wings are present, but very narrow; scutellum rather long, pointed, finely rugose, but foveæ large, shallow and smooth. *Abdomen* shining yellowish brown, lightest anteriorly, second segment very long and deep, and nearly concealing the remaining ones. *Legs* light yellowish brown, except the posterior pair, which are much darker; ungues simple. *Wings* hyaline, veins slender and mostly colorless, areolet present, but indistinct, radial area open. Length: body, .10 inch.; wings, .12 inch.; antennæ, .08 inch.

4. **A. (Callirhytis) ruginosus** n. sp.

GALL.—A hard, round knot, nearly an inch in diameter, near the tip of a slender twig of Q. (virens?) The surface rough and blackened and deeply and irregularly fissured, probably by drying, with several holes made by the escaping insects. Polythalamous, the walls of the numerous larval cells not separable from the firm, but rather open cellular tissues around them. This gall resembles those of *A. Suttonii*, but is much more rough, and is entirely destitute of woody fibre.

Sent me by Mr. Howerton from New Mexico. Five gall-flies reared; all females.

Gall-flies.—*Head* black, very broad behind the eyes, breadth twice its depth, vertex rugose; antennæ long, slender, yellowish brown to dusky towards the end, fourteen joints, first abruptly clavate, second not thicker in the middle than at the ends and nearly as long as the first; third one-half longer than the two preceding; fourth to the eighth gradually shorter, remainder equal. *Thorax* black, mesonotum roughly pitted and wrinkled, and more deeply posteriorly; a few short, white hairs towards the scutellum; median line reaches half way to the collare, and two parallel lines half way to the scutellum; parapsidal grooves entire; these and the lines over the base of the wings present, but quite obscure; scutellum very roughly pitted and wrinkled, two large, rough pits (foveæ) at the base, and a smaller intermediate one. *Abdomen* smooth, shining,

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light yellowish brown, slightly darker in the middle of the very large second segment, others narrow. *Legs* dark brownish red, ungues simple. *Wings* large, hyaline; veins slender, yellowish brown; areolet not large, but distinct; cubitus fading out close to the first transverse, but not touching it; second transverse bent, but not angulated at the base of the broad, open radial area. Length: body, .13 inch.; wings, .16 inch.; antennæ, .13 inch.

5. **A. (Callirhytis) saccularius** n. sp.

Small, hemispherical, pouch-like galls, attached by their full diameter to the underside of the leaves of Q. coccinea, the largest not more than three-sixteenths of an inch through. An ordinary ring net for catching insects will give a good idea of the form of this gall as seen on the underside of the leaf. The flat upper surface is formed of the upper lamina of the leaf and is sometimes slightly depressed below and rarely raised above the general surface of the leaf. It appears on this side as a circular scar whose outline equals the diameter of the gall. The gall walls are green like the leaf, and extremely thin, and in each there is a free, oval larval cell like that of *A. pusulatoides* described in this paper, except that it is a short oval, while the other is very long. I was inclined to consider these two as identical, but an examination of the only fly, a male, that I have reared from these galls; their shape, and the larval cell, and the position of the galls on the leaves show it to be a distinct species. I have a number of the galls, and each contains the empty larval cell, showing that my specimens were gathered too late.

Gall-flies.—*Head* black, vertex rugose, face hairy with white hairs; antennæ longer than the body, fifteen joints, color reddish brown at the base to dusky brown at the tip, first short, cup-shaped, second very short, globular, third twice as long as the first and second, fourth and remaining ones one-half as long as the third. *Thorax* black, mesothorax coarsely and unevenly wrinkled, two closely contiguous parallel lines reach nearly half way to the scutellum, parapsidal grooves entire, but rather obscure anteriorly; lines over the base of the wings distinct, and anteriorly nearly uniting with the parapsidal grooves; scutellum very roughly wrinkled, small; foveæ small. *Abdomen* small, shining black. *Legs:* posterior pair dark reddish brown, lighter at the joints; anterior pairs lighter, ungues simple. *Wings* medium size, slightly fuscous, veins dark smoky brown, all uniformly colored, areolet very small, but very distinct; cubitus slender towards the first transverse, but touching it; radial area open and rather broad. Length: body, .10 inch.; wings, .11 inch.; antennæ, .13 inch.

One male specimen from Connecticut.

6. **A. (Callirhytis) seminosus** n. sp.

Galls.—Hard, woody knots, sometimes terminating the shoots in a clump of oak sprouts (Q. castanea?), but oftener an enlargement of the base of the small lateral branches. In my specimens the ter-

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minal galls are an inch in diameter and shaped like a strawberry. The others are about half as large, and of the same shape. All are more or less uneven on the surface. These are all old galls and the outer bark has mostly fallen off, and the entire surface is dotted as thickly as possible with very small, open larval cells. The larger galls must contain, each, several hundreds of these tenantless cells. The cells are distinct from the woody fibre in which they are imbedded, but cannot be separated from it. The galls are easily taken for those of *A. scitula* Bass. and such I took them to be until I found that the insects were very different. *A. seminosus* is a much smaller insect than *A. scitula*.

Opening some of the galls I found several gall-flies, but not one of them is perfect in all its parts. I have the abdomen of one, the thorax, legs and imperfect wings of another, and the head and antennæ of still others, and from these I gather the following characters:

Gall-flies all females.—*Head* black; antennæ short, dark honey-yellow, fourteen joints, the first and third equal; from the fourth to the thirteenth very short, the thickness even exceeding the length, the fourteenth longer and cone-shaped; mesonotum black, finely punctate, not hairy, the parapsidal and interparapsidal parallel lines exist as faint, hardly discernible depressions; the dorsal or median line indistinct, but extending more than half way to the collare; a short, deep depression over the base of each wing; scutellum shining, but irregularly and coarsely wrinkled. The shining foveæ are very deep and separated by an unusually high, narrow ridge. *Abdomen* black and shining, except the posterior margins of the terminal segments, which are yellowish brown. *Legs* dark reddish brown, ungues simple. *Wings* so crumpled that a good description cannot be had, though the veins are faint and the areolet subobsolete. Length of the body .10 inch.

It differs particularly from *A. scitula*, the only species that it can be taken for, in having very large, deep, shining foveæ, while *A. scitula* has none, and in the fourteen antennal joints and the coarsely wrinkled scutellum.

I collected the galls in Rockport, Ohio.

7. **A. (Callirhytis) pilula** n. sp.

Small, round, thin-shelled galls on the blade of the leaves of Q. undulata, collected in southern Utah by Mr. Siler. They are usually situated near the margin of the leaves and always on one of the principal leaf veins, and project equally above and below the surface. The average size is only .15 of an inch in diameter. The galls resemble those of *Neuroterus utricula* Bass. more nearly than any other species known to me.

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I found twenty-five or thirty specimens in a box of *A. Sileri*, and was so fortunate as to find two of them that, though perforated, still contained the gall-flies. These were both females, quite perfect, and the description that follows will, no doubt, well agree with more recent specimens.

Gall-flies.—*Head* black; antennæ yellowish brown, fourteen joints, the first club-shaped, second nearly as thick as long, third equal to the two preceding in length, remaining ones gradually shorter to the last two, which appear as one, except in a very favorable light; they are, together, longer than the two preceding. *Thorax* shining, punctate, parapsidal grooves reach from the collare to the scutellum and converge posteriorly; median line reaching from the collare to the scutellum; fine and even throughout, on the middle of the mesonotum and between the median line and the parapsidal grooves two short longitudinal depressions; scutellum moderately rugose, foveæ large, shallow and widely separated. *Abdomen* shining black, except the clear, brown edges of the segments; second segment, the sides, etc., with a small, densely hairy spot, that looks like frost; sheath of the ovipositor extends slightly above the dorsum. *Legs* reddish brown, lightest at the joints, ungues simple. *Wings* hyaline, veins not heavy, reddish brown, areolet wanting; radial area open, but the second transverse turns upward a short distance along the margin of the wing as in the inquilines, but stops abruptly without closing the area. Length of the body .11 inch.

This species, in the prolongation of the sheath of the ovipositor, the partial closing of the radial area and the obsolete areolet, shows an approach towards characters seen in the inquilines, and that distinguish them from the true gall-making Cynipidæ; still, there are other characters that make it certain that this is a true gall maker.

8. **Andricus? Mexicana** n. sp. (galls only)

"Mountain near Guadalajara, Mexico; on the only large leaved oak that grows there." This is all I know of this species, except what I learn from the gall itself. I do not know who collected it, nor to whom I am indebted for the fine specimens that came to me in a chip-box a year or two ago. I suspect that my friend, B. Pickman Mann, sent them, and that they came from Dr. Palmer's collection.

I have no insects reared from these galls, but they are probably produced by an *Andricus*. They are the largest woolly leaf gall known to me, measuring more than an inch and a half by an inch in length and breadth, and more than three-fourths of an inch in thickness. The color is a rusty yellowish brown. On removing the long and exceedingly thick, woolly covering from the nucleus, I found several openings, through which the insects had escaped. The nucleus is rather hard, and has, internally, a vitrified or crystalline appearance.

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The larvæ are imbedded in this and have no larval cell separable from it. The galls are sessile on the midvein, on the upper surface of the leaf, and the point of attachment extends along the vein one-fourth of an inch.

The leaves of the oak are very large, measuring more than six inches in width, and the species is probably Q. crassifolia, at least the leaves agree with the description and illustration of this species as given in Humboldt and Bonpland's "Plantes Equinoctiales."

9. **D. (Callirhytes) Clarkei** n. sp.

Small, black polythalamous galls. The sterile flowers of Q. ilicifolia transformed into galls in such countless numbers as to make the aments look like elongated blackberries. The largest gall I have found measured .11 of an inch in diameter and contained four larval cavities. Most of them are considerably smaller, having from one to three cavities, and measuring from .05 to .08 inch.

Small as these galls are, and short and early as their season is, at least two-thirds of them contain at this writing (November, 1889) living parasitic larvæ. In most cases nearly every flower has been transformed into a gall, though in a few the galls are sparingly intermixed with the flowers.

At the time the galls were received, early last spring, no flies had made their appearance, but they came out in considerable numbers during the month of May. They are all females, and are described as follows:

Gall-flies.—*Head*, thorax and legs very dark brownish red. The head minutely punctate: antennæ thirteen jointed, first joint club-shaped, second very short, oval, third slender and a very little longer than the two preceding; fourth, and remaining, to the eleventh gradually shorter; the twelfth and thirteenth so closely connate as to appear as one very long joint, the suture only visible in a favorable light, the thirteenth joint long, and with a false suture close to the end; mesothorax finely punctate; two short, parallel lines from the collare, a very short median line from the scutellum, parapsidal grooves extending from the collare to the scutellum and moderately converging on the latter; line over the base of each wing, all these present, but less prominent than usual; scutellum rugose, foveæ present, but very small. *Abdomen* dark, shining, second segment very long and covering the terminal ones in most dry specimens. *Legs* more dusky red, and tarsi paler than the parts above, ungues black, one-toothed. *Wings* hyaline, veins almost entirely colorless; areolet absent, the cubitus subobsolete, radial area open, the second transverse vein ends abruptly before reaching the margin of the wing. Length: body, .07 inch.; wings, .08 inch.; antennæ, .06 inch.

From Miss Cora A. Clarke, Jamaica Plain, Mass.

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ANDRICUS Hartig.

1. **A. cicatricula** Bassett.

Cynips cicatricula (gall) Bassett, Can. Ent. xiii, p. 101.

I described the gall of this species in 1882 and published it in the "Canadian Entomologist" of that year, but found that the gall-flies, of which I had reared a large number, were ruined by dampness. I here republish the description of the gall and add a description of the gall-flies.

"Polythalamous galls on the midvein of the leaves of Quercus alba never more than one on a leaf, and situated sometimes at the base, but usually from one-fourth to one-half way from the base, rarely above the middle. They project one-third below and two-thirds above the surface of the leaf; they are rounded on the under and cone-shaped on the upper surface of the leaf. The gall is solid and somewhat fibrous, and in its shorter diameter measures about one-half inch, and in the longer from five- to seven-eights of an inch. The larval cells radiate in all directions from the centre of the gall and are quite numerous. There is, at or near the summit of the cone, a small scar or indentation. which is always present, and so characteristic as to suggest the name I have given to the species."

Gall-flies.—Male.—*Head* black, vertex microscopically reticulated; antennæ long, with fifteen distinct joints, first and second dark reddish brown, remainder light, shining yellowish brown, first joint short, heavy, second short, ovoid; third one-fourth longer than the first two, slightly curved, but scarcely incised; fourth to the fourteenth subequal and each as long as the first and second taken together, last short, cone-shaped. *Thorax* black, shining; mesothorax rounded and with regular transverse reticulations; two short, faint parallel lines; parapsidal grooves entire, slender and almost parallel, but slightly convergent towards the scutellum; scutellum finely rugose, foveæ large, shining. *Abdomen* small, the first segment longer and more plainly seen than usual, second very long, nearly round, polished, black, only the edge of the remaining ones visible. *Legs:* posterior pair dark brown with pale joints, the anterior pairs light reddish brown, ungues two-toothed. *Wings* hyaline, veins slender, first and second transverse and the submarginal brown, the rest nearly or quite colorless; areolet small, distinct; cubitus disappearing half way to the first transverse, radial area open and of medium width. Length: body, .07 inch.; wings, .10 inch.; antennæ. .08 inch.

Female.—*Head* and thorax as in the male; antennæ with thirteen joints of a clear light brown color, growing somewhat dusky in the last few joints *Abdomen* shining black, except the venter, which is a clear translucent brown; second segment long, broad; sheath of the ovipositor extends above the dorsum as in *A. operator* O. S., and in all the species that belong to the inquilinous genus Ceroptes. *Legs* all dark reddish brown. *Wings* as in the male. Length: body, .10 inch.; wings, .12 inch.; antennæ, .07 inch.

Connecticut.

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2. **A. speciosus** n. sp.

I have not been able to determine the species of oak which produces these galls. They were sent me by Mrs. E. H. King, of Napa City, Cal.

Globular galls growing on the underside of oak leaves (I have one leaf with a gall on the upperside). The largest specimens are three-fourths of an inch in diameter and the smallest less than half that size. The galls of ordinary size are covered with short, blunt horns to the number of fifty or sixty, while the smallest have as few as ten or twenty. The entire gall is, when fully matured, of a delicate pink color, though in some of the smaller specimens this is almost wanting. The walls of the galls are thick, of a shining crystalline character, enclosing a scarcely separable larval cell, and showing traces of pink lines beneath the surface.

Both galls and gall-flies are among the most beautiful I have ever seen. The insects that I have (fifteen in number) were all cut out of the galls, but were living at the time, and continued alive for several days.

They probably live in the galls through the winter, and, as they are all females, they belong to the class of agamous species.

Gall-flies.—*Head* dark brownish red, cheeks with a broad furrow; antennæ black, short, with fourteen joints, the first and second subequal, the third one-fourth longer than the first two taken together, the fourth equal to the first two, the fifth, sixth and seventh gradually shorter, the seventh to the fourteenth very short, all somewhat hairy. *Thorax* black, and rather sparsely covered with microscopic hairs; the surface presents an extremely fine crackled appearance; two broad and smooth parallel lines from the collare half way to the scutellum; parapsidal grooves deep and rapidly converging towards the scutellum and the furrows over the base of the wings deep and *uniting with the parapsides before the latter reach the collare;* scutellum dull black from the light hairs, and the moderately rugose surface; foveæ large, and, like the rest of the surface, rugose. *Legs* black and shining beneath the sparse, short, white hairs; ungues two-toothed. *Abdomen* small, shining, black with the sheath of the ovipositor shading from dark to light amber, and a few microscopic hairs on the anterior half of the second segment. *Wings* clear, with minute hairs; veins clear, dark brown, almost black; areolet present, but very small; cubitus slender and of uniform size throughout, second transverse with an angle in the base of the short, broad and open radial area, *a bright red spot in the centre of the lower half of the marginal and the submarginal cells;* that in the marginal the brightest. Length: body, .12 inch.; wings, .16 inch.; antennæ, .10 inch.

3. **A.? indistinctus** n. sp.

Small, round galls attached by a broad base to the small twigs of Q. alba. Smooth when fresh, but the dry galls are wrinkled and

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closely resemble pepper corns. The diameter of fresh galls is about three-sixteenths, while the dry ones are about one-eighth of an inch. They contain no true larval cell, separable from the gall walls, which are thin and of a loose texture. They are monothalamous, and the insects were nearly mature in October when they were gathered and came out before the next spring. Their coming out was probably hastened by the warmth of the room in which they were kept. I found them in northern Ohio in 1885; they seem to be extremely rare, I having found them on one occasion only and then only seven or eight individuals. From these I reared three female gall-flies, which are described as follows:

Gall-flies.—*Head* dull brownish black, the brownish hue only discernible in a strong light, and most apparent on the face and cheeks; a few scattered hairs on the vertex; antennæ dusky brownish black, slender, thirteen jointed, second joint short, globose, the third one-fourth longer than the first and second taken together, and the fourth equaling them in length, remaining ones nearly equal, and the terminal so closely joined that counting them is a difficult matter. *Thorax* black, somewhat hairy, but not evenly so; parapsidal grooves distinct towards the scutellum, but disappearing before reaching the collare; the two parallel lines on the anterior half of the mesonotum extremely faint, but smooth and shining; scutellum hoary, with suberect yellowish hairs, foveæ indistinct. *Abdomen* black, first segment short, second long, rather densely hairy on the sides; anteriorly the abdomen is compressed, truncate posteriorly and concealing almost wholly the remaining segments; ovipositor exserted, the sheath hairy at the tip. *Legs* brownish red; ungues two-toothed. *Wings* with a faint smoky tinge, large; veins distinct, but not heavy, brownish red; areolet medium size, the veins bounding it, except the second transverse, very slender; cubitus not quite reaching the first transverse, radial area open, rather narrow. Length: body, .12 inch.; wings, .12 inch.; antennæ, .11 inch.

4. **A. Howertoni** n. sp.

GALLS.—Woody, club-like enlargements of the tips of the twigs one of the New Mexican oaks, species uncertain. They bear some resemblance to the galls of *A. clavula* Bass. and *A. similis* Bass. When green they are covered with leaves even more completely than the first named well-known species, and these and their large stipules still adhere to the dried galls. They are monothalamous, the enclosed larval chamber is not free, and is placed near the base of the gall and immediately above it is a much larger, irregular open space, through which the insect passes in leaving the gall. The galls are rather irregular in shape, but when green are probably about three-fourths by one-half inch in diameter. In some specimens the gall does not wholly retard the axis of growth, and short, leafy stems project out of it.

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By cutting open the galls I have secured a perfectly developed fly of the female sex. The description is as follows:

Gall-fly.—Entire insect a very dark reddish brown, clear, but not shining, the head lightest. *Antennæ* somewhat dusky, thirteen joints, first and second short, third one-half longer than the fourth, the remaining joints short, except the thirteenth, which shows an indistinct suture. *Thorax* darker than the head and easily taken for a dull black on account of the short, evenly disposed and closely appressed hairs that cover it and the scutellum; parapsidal grooves narrow and indistinct, hidden in the hairs; lines over the base of the wings more distinct, intermediate ridges quite imperceptible. *Abdomen* smooth and polished, second segment very long and with a few scattered hairs on the sides near the base. *Legs* dark red, somewhat paler at the joints; ungues two-toothed. *Wings* hyaline, veins pale brown; areolet small, cubitus indistinct; radial area open. Length: body, .12 inch.; wings, .13 inch.; antennæ, .08 inch.

Received from Mr. W. J. Howerton.

5. **A. Maxwelli** n. sp.

GALLS polythalamous, but rarely containing more than half a dozen larvæ. Globular or oval, though sometimes somewhat irregular in shape. From three-eighths to five-eights of an inch in diameter, yellowish brown to dark brown, mostly smooth and shining, but some of my specimens are slightly rough and opaque. Internally, of a soft pith-like cellular tissue and without distinct larval cells.

I received these galls many years ago from Mr. W. R. Maxwell, of Palestine, Texas, but did not learn from what species of oak they were collected, nor whether they were leaf or twig galls, though they are probably the latter.

Gall-flies.—Male.—*Head* and thorax black and shining, with an approach to very dark, reddish brown when seen in strong light, beautifully and evenly, but very finely punctate on the vertex and the entire mesonotum; antennæ fifteen jointed, the first and second joints short, subequal, third a little longer than the two preceding taken together, club-shaped, slightly curved and incised, all the remaining joints gradually shortening and tapering to the end; mesonotum with two fine parallel lines extending half way from the collare to the scutellum, and a median dorsal line rather more than half way from the scutellum to the collare; parapsidal grooves very fine, smooth and shining and less convergent than usual; the lines usually found over the base of the wings are, in this species, reduced to short, oval-indentations; scutellum dull opaque black, and finely rugose, the foveæ widely separated, polished, large, but not deep. *Abdomen* with slight tinge of brown, second segment very long, almost concealing the remaining ones. *Legs* a uniform brownish yellow, but a shade darker than the antennæ, ungues two-toothed. *Wings* hyaline, veins distinct, first transverse rather heavy and almost black; areolet small, cubitus pale, reaching the first transverse, second transverse angulated at the base of the open radial area, and the stump of a vein almost always present at the point of this angle very prominent in this species, and the second transverse vein stops suddenly before reaching the margin of the wing. Length: body, .11 inch.; wings, .12 inch.

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Female.—*Head* and thorax very dark brownish red, punctation same as in the male; antennæ thirteen joints, a shade darker than the male; the mesonotum differs from the male as follows: there is no median line and the grooves over the base of the wings extend quite to the base of the scutellum, which is wrinkled rather than rugose and the foveæ less polished and less widely separated. *Abdomen* shining, and of the same dark red as the thorax. *Legs* darker than the male. *Wings* show no difference; ungues two-toothed, placing it in the genus *Andricus*. Length of the body .12 inch.; wings, 14 inch.

Described from twelve specimens reared in April, 1877.

ACRASPIS Mayr.

1. **A. macrocarpæ** n. sp.

GALL perfectly oval in form, .15 of an inch in length by .12 in thickness. Generally found on the lateral veins on the underside of the leaves of Quercus macrocarpa, but occasionally found on the upperside. They are attached lengthwise to the vein and the point of attachment is .10 inch. long. The hole made by the escaping gall-fly is invariably on the end towards the base of the vein, but this is not always the case with the parasites that infest this species.

The surface presents a crackled appearance, fine lines dividing it into a large number of facets, each of which is crowned with a short hard point. The facets are angular in outline, and with from three to six unequal sides; they are never rectangular and the prevailing figure is an irregular pentagon. The color, when young, like that of the leaf. There is no free larval cell for the single larva and the space between the outer and inner surface of the gall is filled with a hard, crystalline, pinkish substance.

Twenty to twenty-five galls are sometimes found on a single leaf, but usually the number is much smaller.

The gall-flies are all females, with rudimentary wings; they leave the galls in the autumn, but their further history has not been traced.

Gall-flies. *Head* black; antennæ with fourteen joints, black, long and slender, first joint ovate, second small, oval: third twice as long as the two preceding taken together: the fourth, fifth, sixth and seventh, each gradually shorter; remaining ones short and subequal; face and cheeks hairy. *Thorax* grayish by reason of the short, appressed hairs; mesonotum very short, parapsidal grooves are present, but obscured by the hairs; scutellum comparatively large and elevated posteriorly and nearly as long as the mesonotum. *Wings* veinless, narrow scales as long as the entire thorax. *Abdomen* black, compressed laterally, and the sides of the second, third, fourth and fifth segments covered with short appressed hairs; dorsal and ventral parts and the terminal segments smooth, shining black. *Legs* dark brown; ungues two-toothed. Length: body, .11 inch.; antennæ, .10 inch.

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I have collected these galls in northern Ohio and in St. Lawrence County, N. Y., and have received specimens from Mr. C. P. Gillette that were found in Michigan and Iowa. Those collected by myself grew on Q. macrocarpa.

2. **A. politus** n. sp.

Gall-flies.—Entire insect black. *Head* smooth, shining; antennæ with fourteen distinct joints; first large, club-shaped, second oblong-ovate, third as long as the first and second taken together, fourth two-thirds as long as the third, remaining ones rather short. *Thorax* very small, smooth and shining; scutellum minute, short and apparently without foveæ; the usual rudimentary wings are absent. *Legs* brownish black and shining, except the tarsi, which are dusky and nearer brown than black. Length .07 inch.

Two specimens sent me by Dr. C. V. Riley, who received them from J. G. Barlow, of Washington County, Mo. I have no galls, and am not informed whether they were captured at large or reared from galls.

It is the smallest species known to me, and is closely allied to the genus *Biorhiza*.

AMPHIBOLIPS Reinh.

1. **A. Caroliniensis** n. sp.

The galls belong to the oak-apple family, and much resemble those of *A. spongifica* O. S. and *A. cocinnæ* O. S., but the surface is more coarsely reticulated and less glossy, and internally the spongy mass surrounding the larval cell is of a much darker color. The shell is also much thinner, and, in my dried specimens, is irregularly shrunken and depressed, until they look like pressed figs.

I am not sure as to the species of oak on which they grew, but the few immature leaves that came with the galls seem to be those of Q. obtusiloba. The galls are attached to the midvein near the base of the leaf and prevent its development beyond the point of attachment; they are as large as those of *A. spongifica*, and differ widely from *A. cinerea* described by Mr. Ashmead.

The single female gall-fly in my collection very closely resembles the two scarcely separable species just mentioned, but the head and thorax are black, while in those they are very dark brownish red. The parapsidal grooves are scarcely recognizable in the sculpturing, which is coarser than in the two species just named. The legs are a shade darker than the clear reddish brown of those and the abdomen has the same shining reddish brown, but the second segment is considerably shorter than in those. The wings are a shade less fuscous, the first transverse vein more distinctly defined, and the dark cloud in the base of the open radial area smaller and not involving the

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small areolet, though reaching quite to it on the anterior side; ungues two-toothed. Length: body, .21 inch.; wings, .21 inch. (the antennæ broken.)

I received this species from Mr. M. E. Hyams, of Statesville, N. C.

2. **A. Palmeri** n. sp.

Two or three years ago I received from Mr. B. Pickman Mann a very large oak apple gall which he had received from Dr. Edward Palmer. It was written upon as follows: "Summit of Sierra Madre, Chihuahua, Mexico. Winter 1885–86, Dr. Edward Palmer."

It was the largest oak apple gall I had ever seen, and I kept it very carefully, hoping to rear an insect from it, but none appeared.

On this New Year's morning, 1890, I ventured to cut open the precious gall, and was rewarded by finding in it the largest gall-fly I have ever seen. The fly had eaten its way out of the larval cell, and to the outside shell, but becoming discouraged, it had backed its way into the cell again and died. In forcing itself back one of its wings had been turned towards the head and so remained.

It gives me very great pleasure to dedicate this remarkable species to the discoverer, Dr. Edward Palmer.

GALL.—This immense monothalamous gall is of a light yellowish brown color, round, and measuring two and three-fourths inches in diameter. The slightly uneven surface is polished and shining; the shell is thin, but firm, and the interior of a soft, uniform, spongy consistence throughout. The color is yellowish brown to almost white at the centre; the larval cell is oval, and measures three-eighths by five-sixteenths in diameter, and is one-sixteenth of an inch thick. The spongy substance immediately surrounding it is no more dense than in other parts.

Gall-fly.—Female.—Entire body black. *Head:* face unevenly wrinkled, vertex and thorax deeply and irregularly wrinkled; antennæ black, very short, thirteen jointed, first joint heavy, second short, third one-half longer than first and second together, fourth one-half as long as the third, the remaining short to the last, which is a little longer than the twelfth; mesonotum, two obscure parallel lines, and a line over the base of each wing and the faint parapsidal grooves can only be seen in a side light, and they scarcely interrupt the general rugosity of the surface; scutellum even more coarsely wrinkled than the other parts and unique, in that it is considerably broader in the middle than on the anterior side and is not only truncate posteriorly, but is really emarginate; foveæ large, rough, with a low irregular line separating them and a high ridge bounding them laterally, the whole polished and shining. *Abdomen* black, second segment occupies one-half of the whole, anterior half of this segment smooth and shining, and with a few scattered hairs, the posterior half and the visible parts of the remaining segments, all of which can be seen, distinctly and beautifully reticulated or

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punctate, except a very narrow polished band on the margin of each. *Legs* black, shining and with a few scattered hairs. *Wings* dark, smoky brown, a very dark brown cloud covers the areolet and the lower half of the radial area; beyond this and extending across the radial area and almost to the posterior margin is a light, nearly colorless spot, and the anterior margin from the dark, broad, first transverse vein to a short distance beyond the second transverse is of the same light color, the tip of the wing beyond the light spot is of the same dark smoky hue as below this spot; the areolet well defined, but very small; radial area open, large and broad. Length: body, .27 inch.; wings, .24 inch.; antennæ, .13 inch.

NEUROTERUS Hartig.

1. **N. flavosus** n. sp.

Flattened, polythalamous galls on the leaves of Quercus tinctoria varying in lateral diameter from one-fourth to almost an inch; they project from both surfaces of the leaf, but more prominently from the upper surface; their vertical diameter is not more than one-fourth of an inch. The upper and under surfaces, especially the first, bear a very close resemblance to a honey-comb. This resemblance is more striking after the insects have left, when the upper surface is literally full of holes. In general appearance they resemble the galls of *N. majalis* Bass., but when green they are less succulent, and when dry they are of an extremely hard, ligneous texture, while the others are soft and pith like. I collected old galls in September, 1888, from a single oak tree in Rockport, Ohio. This year my nephew, Charles Nichols, collected a large quantity from the same tree, and from them I have reared a large number of gall-flies. These are of both sexes, and are described as follows:

Gall-flies.—Male.—*Head* broader than the thorax, black, shining; cheeks with indistinct furrows; antennæ fifteen jointed, first dark brown, second lighter, and the remaining ones light yellowish brown; the first and second oblong oval, and nearly the same length; the third slightly longer than both the preceding, club-shaped and curved, but only slightly incised, remaining joints of uniform length and but a little shorter than the third, the whole exceeding by two or three joints the entire length of the body. *Thorax* black and shining, but a powerful magnifier reveals a finely and evenly crackled surface; parapsidal grooves apparent posteriorly, but soon disappearing; by the deeply incurved posterior margin of the mesothorax the scutellum has a rounded outline; furrow of moderate depth and foveæ subobsolete: surface of the scutellum same as the mesothorax. *Abdomen* small, black and shining, second segment in dry specimens almost concealing the remaining ones, but in the living insect the terminal ones are visible and form a cone-like termination to the abdomen. *Legs* light brown, somewhat darker in the middle of the femur and tibia: claws simple. *Wings* of moderate size, hyaline, but when in a certain light they show a faint steel-blue reflection; this is more noticeable where several hundred specimens are seen together; veins slender, brown, fading to colôrless lines; areolet wanting. Length: body, .05 inch.; wings, .05 inch.; antennæ, .06 inch.

Female.—*Head* pale brown, shading to black on the posterior margin of the vertex; antennæ shorter than the body, pale yellowish brown, growing dusky

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towards the end; first and second joints short, globose, the third very slender; the rest gradually thicker to the last. *Thorax* black, less shining and more coarsely crackled than in the male; the parapsidal grooves less distinct, and the scutellum less smooth than the male. *Abdomen* black, shining; the second segment longer than the remaining ones, but not concealing them. *Legs* dark brown, with paler joints. *Wings* hyaline, with the steel reflections noticed in the male; veins more distinct, areolet small, generally but not always present; radial area broader and shorter than in most of the gall-making Cynipidæ; the ovipositor is often seen fully exserted in the dry specimens, and is four or five times the length of the body. Length: body, .08 inch.; wings, .08 inch.; antennæ, .05 inch.

As other oaks of this species in this vicinity yielded no galls of this sort it may be that this colony is sporadic, and that its true habitat has not been discovered.

2. **N. pallidus** n. sp.

GALLS in dense clusters at or near the end of the aments of Q. bicolor, but seldom found on the basal half of the flower stems. It is safe to call them monothalamous, though now and then a gall is found that contains two larval cavities. The galls are of a fine, soft cellular consistence, easily crushed in the fingers, and contain no separate larval cell. They are of a pale, faded wood color and smooth, and unevenly globular. They seem to be free from the attacks of parasites, for among thousands of galls I fail to find a single one.

The flies mature earlier than the two species already described as found on the sterile flowers of the oak, for, when found, the insects had gone with the exception of a few belated ones, from which I have made the following description. They are of both sexes.

Gall-flies.—Female.—*Head*, except the dark eyes, almost colorless in some specimens, or at most of a pallid yellowish brown, and in others dark brown to a shining black on the vertex. *Legs* and the first three joints of the antennæ same color and semi-transparent; antennæ thirteen jointed, the first and second not differing much in form and size, both rather large, third long, pale, remaining changing gradually to a dusky brown; mesothorax smooth, shining throughout; scutellum also smooth and shining, foveæ wanting. *Legs* almost colorless, except a slight brownish tinge in the femur; ungues black, simple. *Abdomen* black, the diameter from the dorsum to the venter considerably more than the length. *Wings* large, hairy, veins dark and distinct, areolet of medium size, cubitus slender and reaching quite to the first transverse, radial area long, narrow, open. Length: body, .06 inch.; wings, .08 antennæ, .05 inch.; these measurements are from dry specimens and probably rather too small.

Male throughout of the same pallid hue seen in the antennæ, and legs of the female; antennæ fifteen jointed, otherwise as in the female. *Abdomen* small, briefly petiolate and the posterior dorsal portion darker than any other part of the body. Wings do not differ from those of the female.

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3. **N. pallipes** n. sp.

GALLS small, monothalamous, variously situated on the stem and principal veins of very young white oak leaves, dwarfing and distorting them, and densely covered and often nearly hidden in their pubescence. They are oval, thin walled, and only large enough to contain the larva of the small gall-fly.

I have forty male and female insects of this species, but there is only one, a female, whose antennæ remains unbroken.

Gall-flies.—Both sexes are black and shining; the female antennæ with thirteen joints, and, like most of this genus, the first two joints very large, short, almost globose, and the rest long and slender; they are pale brown at the base, growing dusky towards the tips; the third joint is scarcely longer than the fourth; the male abdomen long, petiolated; the wings of both sexes large; the veins distinct, but not heavy; areolet large, and bounded by very slender veins, cubitus reaching the first transverse vein, radial area open, long and narrow; the legs in the female almost colorless, and in the male brown or brownish in the middle of the tibia and femur only. Length: body, .05 inch.; wings, .06 inch.

The insects differ materially from *N. utricula* Bass., though the galls resemble those quite nearly.

This species was received from Miss Cora A. Clarke, to whom I am indebted for several other very interesting species.

4. **N. politus** n. sp.

The galls are developed on the midvein of the leaves Q. undulata? and are three-fourths of an inch long and half as thick. They are polythalamous; larval cells perpendicular to the surface of the leaf. They might easily be taken for galls of *Andricus nigræ*, *A. tumifica* and other species found on the midvein of oak leaves, but the insects are distinct from any produced from similar galls.

Gall-fly.—Male.—*Head* black; antennæ fourteen jointed, first and second joints pale yellow, remaining ones yellowish brown, all very slender. *Thorax* without furrows or grooves; thorax and abdomen black and very smooth; scutellum separated from the mesothorax by a smooth, shining furrow; a few scattered hairs on the posterior half of the scutellum. *Abdomen* long petiolated, second segment small, the remaining ones very small. *Legs* pale yellow. *Wings* large, veins brown, slender, the cubitus reaching the first transverse and of equal size throughout, areolet very small, radial area large, long and open.

My few specimens, cut from the galls, are too imperfect to furnish a more complete description. One of them, apparently a female, is considerably larger and with darker antennæ and legs, but I will not attempt a description from it.

The galls were found with those of *Andricus Sileri* from southern Utah.

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5. **N. Howertoni** n. sp.

GALLS.—Minute blotches showing on both sides of the leaves of an oak (species unknown to me) found in New Mexico. They are a little less than .05 of an inch by .03 in diameter. I have only two leaves on which these galls occur, the largest, one inch by three-eighths, and on this there are eighteen galls, and they are by no means crowded. There is no free larval cell, and the gall walls are very thin. It is covered with the same pubescence as the rest of the leaf. On the upperside the color is a dull brown, beneath it is the same as the leaf. The insects perforate the gall on the underside.

Eight minute parasites were found in the box containing the galls and one true gall-fly. Six galls were perforated, but the insects had not been able to escape. I removed three of these dead flies and from the four more or less imperfect specimens get the following description:

Gall-flies all females. *Head* black; antennæ fourteen jointed? (I am not quite sure as to the number of the joints); first and second of equal length, short and both very thick; the second thicker than long; remaining joints extremely slender and all pale yellowish brown, changing to dusky in the last six or seven joints. *Thorax* black, shining; scutellum less shining. *Abdomen* shining brown or black, compressed; ovipositor in all my specimens exserted and extending forward to the tip of the scutellum. *Legs:* middle of the femur and tibia dark shining brown or black, with pale joints; tarsi pale yellow. *Wings* not fully expanded, but showing pale brown veins, a large areolet, long radial area and the cubitus reaching only half way to the first transverse vein. Length of the body not quite .05 inch.

Named for Mr. W. J. Howerton, the discoverer.

AULAX Hartig.

Hartig, who founded this genus, wrote "*Aylax*" (Germar's Ent. Zeitschrift, II, pp. 186 and 195–96, and III, pp. 342–43), but changed the orthography to *Aulax* without remark in Vol. IV, p. 413, of the same work. Baron Osten Sacken places a parasitic species reared by him from the galls of *Cynips* (*Andricus*) *futilis* O. S. hesitatingly in this genus (adopting the name as first written), and later adds two other species, *A. pirata* and *A. sylvestris* also reared from oak galls. All these have since been removed to the closely related genus *Periclistis*, and it was left to Mr. W. H. Ashmead to describe the first American species that really belongs to this genus. His *Aulax Harringtoni* is described in the Trans. Am. Ent. Soc. XIV, p. 146.

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To this I here add two new species, both reared from species of Lactuca or Mulgedium (either L. Canadensis or M. leucophæum I cannot determine which without the leaves and flowers of the plants) and both belonging to that section of the genus which Hartig has designated as gall producers. They are all gall makers as distinguished from true Inquilines, but they do not, in all cases, produce galls as the following descriptions will show:

1. **A. podagræ** n. sp.

The long, hollow stalks of Lactuca? Canadensis are often covered in the upper half for a considerable distance with rounded swellings of greater or less extent, that on being opened are found to contain numerous Cynipidous larvæ. The insects produced from these larvæ all have a closed radial area, and, without careful study, I placed them among the inquilinous species, and went on rearing insects in the hope of sometime finding the true gall-maker.

I found that the larvæ did not all live in the galls, but that the pith of the stalks was full of larvæ even where there were no indications of a gall. Sometimes the pith would contain larvæ several feet above and below the space where galls were to be seen.

The galls occur at the leaf nodes, where the ligneous walls of the stalk are thickest, and it may be that the eggs laid between the nodes are placed quite below the ligneous or fibrous part, and that the poison of the sting is inert in the purely cellular portion.

I offer this as a conjecture only, having no proof that this is the true explanation of a very curious fact.

These insects evidently belong to the genus *Aulax*, and, as above remarked, to the gall-making division.

The gall of *A. podagræ* is sufficiently described above, and the description of the fly is as follows:

Gall-flies. Female.—*Head* black, vertex finely reticulated or punctate; antennæ dark brownish red, thirteen joints, first long and club-shaped, second one-half as long, and the third only equal to the first in length, remaining equal and slightly less in length than the third. *Thorax* black, mesonotum with a few scattered hairs and with minute, transverse lines or wrinkles, two lines reaching half way to the scutellum, a median line, broad at its origin on the scutellum, but disappearing half way to the collare, parapsidal grooves entire, lines over the base of the wings; all these very slender, but distinct, and shining; the collare in this as in the species next described, very broad; scutellum rugose, foveæ very large and rugulose. *Abdomen* black, polished, second segment twice as long as the third, and both forming nearly the entire abdomen; feet the same color as the antennæ, deep brownish red. *Wings* hyaline, but showing, in a favorable light, a slight irridescence; veins dark, and of nearly uniform size, areolet medium size and well defined; radial area broad, closed. Length: body, .10 inch.; wings, .10 inch.; antennæ, 10 inch.

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Male.—The male differs only in the usual sexual variations, viz., the antennæ fourteen jointed, the third joint curved and incised, the smaller abdomen and the smaller size.

Among the thousands of this species that are in my collection not more than one-tenth are males.

2. **A. tumidus** n. sp.

GALLS.—Swellings of the main stalks of that variety of Lactuca that is found in old and dry fields. They are commonly near the summit of the stalk, often in the panicle itself, and then covered with the short flower stems. They vary greatly in size from slight, knotty and irregular enlargements of the stalk to large and more or less regularly ovate galls two or three inches long and an inch in diameter. The larvæ are imbedded in the soft pith that usually nearly or quite fills the galls. They can hardly be said to have larval cells, though a thin transparent coating lines the cavity in which each one lies. They are polythalamous, though far less prolific than the species just described.

These galls attracted my attention many years ago, but I not only confounded them with the species last described, but consigned them both so the subfamily Inquilinæ, because of the closed radial area in the wings of the imagos.

Gall-flies.—Female.—*Head* and thorax black; antennæ translucent brown at the base to dusky brown at the end, thirteen jointed, the first joint short and small, the third, fourth, fifth and sixth equal, remainder gradually shorter to the thirteenth, which is long, and shows an indistinct annulation; facial ridge broad and high, vertex finely and sharply reticulated; the head is more decidedly subquadrate than that of ony other species known to me in the whole family of the Cynipidæ. *Thorax*, like the vertex, sharply reticulated; collare very broad; pleuræ beautifully striate; parallel lines on the mesothorax short. and so indistinct, as to be seen only in the most favorable light; median line short and narrow; parapsidal grooves very narrow, and almost parallel until close to the scutellum, where they converge; lines from the scutellum towards the base of the wings are not heavy, but quite distinct; the short, closely appressed, microscopic hairs on the thorax give to it a silky appearance and obscure somewhat the beautiful reticulation beneath; scutellum slightly rugose and with somewhat coarser microscopic hairs; foveæ large, shallow, not smooth. *Abdomen* shining, semi-translucent brown, second segment of moderate length, and with a small, dense tuft of hairs far down on the sides of the anterior margin, and easily overlooked; in some specimens a few hairs are seen over a much larger portion of this segment; third segment a little shorter than the second, and the remaining ones quite narrow. *Legs* dark reddish brown; ungues simple. *Wings* with a faint smoky tinge, veins yellowish brown, not heavy, areolet wanting, cubitus reaching two-thirds of the distance to the first transverse, radial area closed. Length: body, .14 inch.; antennæ, .10 inch.; wings, .12 inch.

Male.—Black, except the legs and antennæ; antennæ fourteen joints, third short curved and incised; all dark brownish red, legs yellowish brown. Length: body, .12 inch.; wings, .12 inch.; antennæ, .11 inch.

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MAR 3 1897

THE PHYCITIDÆ OF NORTH AMERICA.

BY GEO. D. HULST.

The object of this paper is to give a compilation of what has been published upon the Phycitidæ of North America, together with what has been learned by personal investigation and study.

In the study of the family several difficulties have presented themselves:

First. Nearly three-fourths of all the types of the species are in European Museums, and nearly or quite half in private collections.

Second. The material for study has been comparatively small. The species have been less collected than in any other family of the Lepidoptera. No one has given them systematic and careful study, and no means have existed for the determination of species. Collections are few, very incomplete, and almost entirely without names for the insects by chance gathered together.

Third. The literature upon the subject while not voluminous, is very fragmentary, and is found in large part in various foreign periodicals, and in privately printed and circulated foreign papers.

I have, however, been able to give personal study to the greater part of the species, and I hope whatever be the incompleteness of this paper, that it will serve to stimulate interest and study in the family, and make it possible for Americans to know a little more of this hitherto neglected portion of the fauna of this country.

The Phycitidæ are a family of moths belonging to the super-family Pyralidæ. The hind wings have three internal veins, and the family is thus separated from the Macrolepidoptera. None of the internal veins of the fore nor hind wings are furcate at the base, the cilia of the hind wings are comparatively short, and these wings never lanceolate, and in one or more of these distinctions the family is separated from the Galleriidæ, Tortricidæ and Tineidæ. The maxillary palpi do not lie closely on the porrect labial palpi, or are not broadly scale tufted, and the family is thus separated from the Crambidæ. The lower median vein of the hind wings has a pectination of long hairs at and near the base above, and the family is thus separated from the Pyralididæ.

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The family is one of considerable extent, comprising, in the world, about one thousand species. Of these about two hundred are from the North American fauna. It is probable, however, that not half of our species have as yet been described.

The Phycitidæ were originally included, by Linnaeus, under the group *Phalena Tinea*. Fabricius (Ent. Sys. Sup. p. 463, 1798) first gave a distinctive name to the group calling it *Phycis*. This name was, however, given to a group of fishes by Artedi in 1738. I am informed by Dr. Hagen that the name "*Phycis*" was applied again to a group of fishes by Waldbaum in 1792, so the name was preoccupied. Curtis (Brit. Ento. 1828, p. 233), recognizing the fact, proposed the name "*Phycita*" in place of *Phycis* Fab. In view of this, as the family name must be based upon some included generic name, the term Phycidæ, often used for the group, cannot remain, but instead there must be used the term Phycitidæ as proposed by Mr. Ragonot.

The first division of the family into sections corresponding with modern genera was made by Hübner (Verz. 1816), who separated the species of Europe then known into thirteen genera, of which the following are represented in North America: *Hypochalcia*, *Nephopteryx*, *Zophodia*, *Epischnia*, *Myelois* and *Selagia*. As with all of Hübner's genera in the "Verzeichniss" the descriptions are very meager, and the determination must be made by the species placed under the generic name. So far as Hübner's genera of Phycitidæ are concerned, Mr. Ragonot (Ento. Mag. vol. xxii, pp. 18–19) gives the following determinations regarding the species which are to be received as typical:

"*Eucarphia* (Cat. p. 364), included two species of *Crambus* and *vinetella* Fab., which latter becomes type of the genus.

"*Hypochalcia* (Cat. p. 367), comprising *ahenalis*, *œnealis* and *ærealis*, which are all synonymous with *ahenella* S. V. This genus, being composed of but one species, has very properly been retained by Zeller, and characterized by him (Isis 1839, p. 188, 1848, p. 721).

"*Anerastia* (Cat. p. 367). This genus comprises three true *Hypochalciæ*, and lastly *lotella* Hüb.; it would have been proper to retain the name of *Anerastia* for the species of *Hypochalcia* had not the latter genus been so distinctly indicated as I have explained. The genus has thus rightly been restricted by Zeller to *lotella*, and supersedes *Araxes* Steph., which was formed of three distinct modern genera.

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"*Gesneria* (Cat. p. 368). This genus contains *canella* S. V. and three *Scopariæ*, one before and two after *canella*, so that evidently the genus was intended for *Scoparia*, but as the latter genus was already established by Haworth, Zeller properly created the genus *Gymnancycla* for *Canella* S. V.

"*Pempelia* (Cat. p. 369). The genus *Pempelia* was composed of four ill-assorted species: *calocalis* = *anellus* S. V., *quercalis* = *quercella* S. V. (a Pyralid), *palumbella* S. V. and *ornatella* S. V. Zeller divided the genus *Pempelia* into several genera; first, *Etiella* Z. (type *zinckenella* Fr.); second, *Eurhodope* Hüb., comprising *euphorbiella* Zell. (which I refer to *Nephopteryx*, the maxillary palpi not being at all developed into a pencil-like brush as in other *Pempeliæ*) and *carnella* L.; third, *Pempelia*, comprising all *Pempeliæ* with smooth wings, including *ornatella* S. V.; and lastly, *Salebria* Zell. composed of species with raised scales before the first line including *palumbella* S. V. Von Heinemann adopts the last two genera as indicated by Zeller, but rightly mixes the species with raised scales with those with smooth wings, placing in the genus *Salebria* all the species with eight veins to the hind wings, and in the genus *Pempelia* those with seven veins only; thus *palumbella* S. V. becomes the type of the genus *Salebria*, and *ornatella* S. V. that of *Pempelia* Zeller.

"*Nephopteryx* (Cat. p. 370). This is composed of a great variety of genera, so that it is impossible to say which is the type intended. Zeller (Isis, 1846) created the genus *Dioryctria* for the first species (*abietella* S. V.), placing the next species (*rhenella*) in his genus *Nephopteryx* (established in the Isis for 1839), so that *rhenella* Zinck. must be considered the type of the genus.

"*Zophodia* (Cat. p. 370). Of the three species included in Hübner's genus (*legatella* Hüb., *tumidella* S. V. and *convolutella*) *tumidella* is placed by Zeller in his genus *Acrobasis; legatella* and *convolutella* are placed separately in the genus *Myelois* (Isis 1839 and 1848), *Zophodia* forming a subgenus for *convolutella*. Von Heinemann adopted the genus *Zophodia* for *convolutella* Hüb., and there is no necessity to change the name.

"*Epischnia* (Cat. p. 370). The genus was composed of *diversalis* Hüb. (*polygonalis* Hüb.), *prodromella* Hüb. and *muscerdalis* Hüb. (*nebulella* Hüb.) The first, belonging to *Botys*, must be excluded; the second becomes the type of the genus which has been characterized by Zeller (Isis 1839 and 1848).

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"*Myelois* (Cat. p. 371). The only species given by Hübner is *medullalis* Hüb. = *cribrella* Hüb. This genus has become the general refuge of all uncertain species, but as there cannot be any doubt as to the species which forms the type, I restrict the genus to those species alone, which, like *cribrella*, have simple antennæ in the male, eight veins to the hind wings, with veins 4 and 5 in the forewings forked.

"*Selagia* (Cat. p. 371), comprising two *Crambi* and *argyralis* Hüb. (*argyrella* Fab.) This genus has been described by Zeller (Isis 1848), and is composed of two species: *argyrella* Fab. and *janthinella* Hüb., which have wrongly been placed since in the genus *Nephopteryx* proper.

"*Eurhodope* (Cat. p. 371), formed for *pudoralis* S. V. (*rosella* Sc.) and *carnealis* (*carnella* L.). The type of the genus is *rosella* Sc., which has since been placed in *Myelois* Auct., but as the type of *Myelois* is *cribella* Hüb., the neuration of which is different from that of *rosella* Sc., I adopt *Eurhodope* Hüb. for *rosella*, *cruentella* Dup., etc., as well as for *legatella* Hüb., *suavella* Zinck., *advenella* Zinck., etc., as they cannot be distinguished structurally from one another; yet, as the *legatella* group appears so different from the *rosella* group, I establish a subgenus for the former under the name of *Rhodophœa* Guenée.

"*Catastia* (Cat. p. 372). This is a good genus, and has been adopted by Zeller (Isis 1839 and 1848) and von Heinemann."

The laws of modern Zöology determine that when an author places under a genus two or more species not properly congeneric, and indicates no type, the one who afterwards properly subdivides this genus, can restrict the original name to any of the species formerly included under it. The older name, however, must be retained for one of the new divisions. On this basis I am ready to accept the restrictions of Hübner's genera as made by Zeller, von Heinemann and Ragonot. I differ from Mr. Ragonot's conclusions given above on two points only: first, on the basis of the laws of modern zöology and the reasoning employed with regard to *Anerastia*, *Epischnia* and *Selagia* above, the name *Gesneria* must stand in the place of *Gymnacycla* Zeller; second, I differ in my valuation of raised scale ridges as a generic characteristic.

Curtis (Brit. Ent. 1828) puts *Phycita* in place of *Phycis* Fab., as noted above. He also describes *Homœosoma* for *gemina* Haw. = *sinuella* Fab., which thus becomes the type of the genus.

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Stephens (Cat. Brit. Insects, 1829) proposes two new genera, *Oncocera* and *Araxes*. These he described in Brit. Ento. Haustellata, 1834, iv, pp. 313 and 315, but all the species had already been placed by Hübner under his genera, so both become synonyms.

Treitschke's only genus, *Myelophila* (Schmet. Eur. vol. x, pt. 3, 1835) is a synonym of *Myelois*.

Duponchel names two genera, *Ilythia* = *Eurhodope* Hüb., and *Diosia* = *Catastia* Hüb.

Guenée, in his "Index Methodicus" (Ann. Soc. Ento. France, 1845), gives the names of some new genera, but entirely without descriptions. It may be a question with some whether such names should be retained. Zoölogical law determines that a type holds a generic name as well as a description. For myself I consider the knowledge of the type far preferable to any description, and so have no hesitancy in retaining genera where the type is a species assuredly determined. In the "Index" Guenée proposes the following genera: *Megasis*, *Brachodes*, *Chionea*, *Rhodophœa*, *Plodia*, *Ramphodes*, *Ephestia*, *Lotria*, *Semnia* and *Argyrodes*. Hübner's genera are ignored, and, indeed, I doubt whether Guenée then, or at the time he wrote his "Phalenites," knew anything about Hübner. Guenée seems, all through his work, to have entirely lacked the systematic faculty, and his "Index" is valueless as a basis of classification.

The genera represented in the North American fauna are *Megasis*, *Rhodophœa*, *Plodia*, *Rhamphodes* and *Ephestia*.

Megasis ("Index" p. 71) has two species under it, *rippertella* and *dilucidella* Dup. = *illignella* Zell. The latter has been made the type.

Rhodophœa ("Index" p. 74). Mr. Ragonot, in his remarks on Hübner's genera already quoted, says this genus does not differ in structure from *Eurhodope* Hüb. On account of the differences in appearance, however, he retains it as a subgenus. In his Cat. N. A. Phycitidæ he tabulates it as a genus. It is, however, abundantly distinct from *Eurhodope* in that the ocelli are present, while wanting in *Eurhodope*.

Plodia (Index p. 80). This has one species under it, *interpunctella*, and is a good genus.

Ramphodes (Index p. 81). This has one species under it, *etiella* Treit. = *zinckenella* Treit. Zeller, however, created for this species (Isis 1839) the genus *Etiella*.

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Ephestia (Index p. 81). The first species under this, *elutella*, has always been considered the type of this genus, which is a good one.

Next in order as a systematist came Prof. Zeller. He first recognized the true relations of the Phycitidæ, and arranged the species on the basis of a natural classification, which, however much it has been or may be improved upon, will remain permanently a basis of classification in this family.

In Isis 1839, he first published his views of the family. He there separated the species from the Tineidæ, with which they had been grouped from the very beginning. He seemed to have had a knowledge of what almost all others before him had done, recognized Hübner's work and gave him due credit for it. He, in this paper, himself describes *Acrobasis*, *Ancylosis*, *Etiella* and *Phycidea* = *Homœosoma* Curtis. Of these all are represented in our fauna, except the second.

In Isis, 1846, Prof. Zeller again touched upon this family, and described *Dioryctria*, *Salebria* and *Psorosa*. All of these are represented among North American Phycitidæ.

In Isis, 1848, Prof. Zeller a third time reverted to the subject, and gives a synopsis based largely upon structural characters, and thus lays down a natural and permanent basis of classification. In this synopsis Prof. Zeller makes use of the structure of the labial and maxillary palpi, the antennæ and ocelli. He, however, ignores venation, or where noticing it seems to regard it of little systematic value. He also emphasizes greatly the frontal scale tuft, as in his classification of the Tineidæ, a thing which seems to have comparatively little or no value in a natural classification. His knowledge of the maxillary palpi was one of appearance, and not of the real structure of the organ.

In 1863 was published Part 27 of the Catalogue of the Lepidoptera-Heterocera British Museum, and in 1866 Part 35, its supplement. In Part 27, pp. 22–139, and in the Supplement, pp. 1708–49, Mr. Walker describes many new genera. Of these *Stantira*, *Sebunta*, *Benta*, *Melitara* and *Cutina*, are based on American species, and *Subrita* has an American species under it. The type of *Melitara* is *prodenialis* = *bollii* Zell., as I am informed by Mr. Ragonot. Prof. Fernald, who has examined the type informs me *Sebunta* is not a Phycitid, but is a synonym of *Botis illibalis* Hüb.

The rest of Walker's new American genera are as yet undetermined. It is probable also his genera based on material from other

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parts of the world may cover some of the genera more recently created.

Blanchard has described the genus *Elasmopalpus* with his species *angustalis* = *lignosellus* Zell. as type.

Von Heinemann (Schmet. Bruns. Pyralidæ, 1865) largely follows Zeller, showing very little individuality. In his ideas of genera he shows no progress, but rather retrogression. He speaks of the venation, but makes no real use of it in the formation or determination of genera.

Herrich-Schaeffer (Sys. Bear. Schmet. Eur. 1849) gave a synopsis of the genera of the Phycitidæ, created some new genera, and expressed opinions which were radically different from those of Zeller, but which have obtained no currency among entomologists. He places the Phycitidæ under the Crambidæ, considering *Pempelia* and *Nephopteryx* as true Crambids and the rest of the Phycitidæ as occupying subfamily position. His work has very little to recommend it, as it is in many respects of the most superficial character. At the same time he called attention to venation, and made use of it for the determination of genera, though in a very careless and inconsistent manner.

Mr. Grote (Bull. Geol. Surv. Terr. vol. iv, 1878) wrote somewhat upon the genera and species of the Phycitidæ of North America. Here and in detached articles of periodicals, he established as genera *Megaphycis* = *Melitara* Walker, *Pinipestis*, *Dakruma* = *Zophodia* Hüb. *Meroptera*, *Pyla*, *Ambesa* and *Honora*. He made use of structure, but did not understand the European genera, and thus made no advance.

Mr. E. Meyrick has written upon the Phycitidæ of Australia and the adjoining islands, and his papers have been published in various foreign periodicals, principally in the Transactions of the Linnaean Society of New South Wales, vols. iii, iv, and vii, and in the Transactions of the Entomological Society of London, in the volume for 1884.

In these papers he, in addition to some of the structural characters used by Zeller, emphasizes the value of venation, for which Zeller had so very little regard, and which Herrich-Schaeffer so poorly used. This use of venation was an important advance. Mr. Meyrick, however, rather belittles some of the structural details made use of by Zeller, such as the palpi and ocelli. Mr. Meyrick has described many genera, of which not one has a representative in the North American fauna, so far as I know.

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Mr. E. L. Ragonot, in a paper in the Ent. Mo. Mag. vol. xxii, writing upon the Phycitidæ of Great Britain, gives a history of the genera represented in its fauna, and proposes a division of the family into two subfamilies: first, Phycitinæ and second Anerastinæ, distinguished from each other by the presence and absence, or nearly so, of the tongue. He also, p. 31, proposes a new genus *Heterographis*, which is represented in our fauna. In December, 1887, Mr. Ragonot, in the Annales de la Société Entomologique de France, published diagnoses of twenty-three genera from material of the European fauna, of which genera the following have been found to have representitive species in our country: *Anoristia*, *Staudingeria* and *Saluria*.

In December, 1888, Mr. Ragonot, in a paper privately printed and distributed, described, from mostly North American material, twenty new genera as follows: *Phycitopsis*, *Dasypyga*, *Promylea*, *Ortholepsis*, *Lipographis*, *Sarata*, *Macrorrhinia*, *Vitula*, *Ephestiodes*, *Eurythmia*, *Hornigia*, *Ciris*, *Martia*, *Aurora*, *Navasota*, *Peoria*, *Bandera*, *Statina*, *Tampa*, and *Cœnochroa*. Mr. Grote, knowing that *Ciris* was preoccupied, has since proposed *Ragonotia* in its place (Can. Ento. xx, 75). Later, Mr. Ragonot proposed *Dolichorrhinia* for *Macrorrhinia*, which was also preoccupied. The name *Hornigia* is also preoccupied, having been used by Mr. Ragonot before for a genus in the Galleriidæ. It was there a synonym of *Lamoria* Walker. The laws of Zoölogy, however, determine that it must thus remain a synonym, and cannot represent any other group in Zoölogy.

In April, 1888, Mr. Ragonot, in another private paper, described fifty-eight new genera from exotic material, three of which, *Laodamia*, *Diviana* and *Calera*, are American.

In a Catalogue of North American Phycitidæ (Ento. Am. vol. v, p. 114, 1889) Mr. Ragonot names two more genera, *Glyptocera* for *consobrinella* Zell., and *Lætilia* for *coccinivora* Comst., and *ephestiella* Rag. I am not aware that these genera have yet been described.

In his descriptions of genera Mr. Ragonot makes use of all the differences of structure used of by both Zeller and Meyrick. He also makes use of the structure of the tongue, and so introduces a new and important feature into classification. For some reason, however, he seems to take little notice of the ocelli, and of the male genital armature. He also does not seem to know of the structure of the maxillary palpi. It is, however, fair to say that his descriptions are only brief diagnoses, written in anticipation of a promised monograph, and published, according to his own statement, only to

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secure priority. Many points of distinction relied upon by him in venation are to some extent variable, and consequently there may have to be some modification of his genera in the future, when, from larger material, the full range of variation in species can be definitely ascertained.

In "Entomologica Americana" vol. iv, p. 113, 1888, the author of the present paper described twelve new genera of Phycitidæ.

The only division of the family into groups higher than genera is the division noted above, made by Mr. Ragonot. In a paper in the "Entomologist's Monthly Magazine," vol. xxii, he proposes two subfamilies, Phycitinæ and Anerastinæ, distinguished by the presence and absence or nearly so of the tongue. I am not prepared to accept this division of the family, inasmuch as there is a comparatively gradual variation in the length and strength of the tongue in the species. In some cases where comparatively long it is weak, and sometimes where comparatively short it is strong and corneous. Indeed, of the typical genus and species of Anerastinæ, *Anerastia lotella*, von Heinemann, describing the genus, says truly, "die zunge ist zwar vorsteckt, aber vorhanden hornig und gerollt," and again he remarks of the species, "mit deutlicher zunge." The tongue is indeed twice or more the length of the head. Moreover, and this is perhaps more important, neither in this nor any of the higher groups of the Lepidoptera have the presence and absence of the tongue been recognized as having subfamily value. Venation has always been considered of far greater importance, and the subfamilies of the Pyralidæ have been almost entirely based upon the number and course of the veins. The absolute loss of one or more veins would seem to me to be a far better basis for a natural grouping, but even this cannot be relied upon, inasmuch as it separates species that are undoubtedly very closely allied and throws together those widely aberrant; on the one hand some with the strongest Epipaschiid, and on the other hand some with the strongest Cramboid tendencies. I have little doubt, however, that the structure of the genitalia of the ♂ will furnish a basis for a natural and sharp distinction. As will be shown hereafter, there are in the genitalia of the Phycitidæ two marked types of structure, and these conform very closely as well to the general tendencies of structure otherwise in the family. In the one type the lower anal plate is present, spatulate or conical, agreeing with the Epipaschiid type; in the other the lower plate is wanting. On this basis I propose the division of the family into

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two subfamilies, the first Phycitinæ Rag., the second, to which would be given Mr. Ragonot's second subfamily name "Anerastinæ," were it not that *Anerastia* does not belong to this group; I propose, therefore, as the name of the second subfamily Peoriinæ, with *Peoria* Rag. as the typical genus.

The first American species described were cosmopolitan, and were described by Haworth and Hübner from European examples. The first distinctively American species were described by Prof. Zeller. Since that time one or more species each have been described by many authors in all sorts of places and publications, the largest number being by Mr. Ragonot, in a paper privately issued in Paris, December, 1887.

The species of the Phycitidæ are in many respects as compared with each other very diverse in their structural characters. Indeed, there is scarcely any detail of structure in which marked variation may not be found; the variability is especially observable in the shape and ornamentation of the labial palpi, the maxillary palpi, the tongue, the clypeus, the antennæ, the wings, the venation, the abdomen and the genitalia. There is also a marked variability in some respects in the sexes of the same species, notably in the maxillary palpi, the antennæ, and in the ornamentation of the wings and abdomen.

STRUCTURE OF THE IMAGO.

THE HEAD AND APPENDAGES.—The *head*, as a whole, is unconcealed, prominent, free, and usually nearly as broad as the thorax.

LABIAL PALPI.—The *labial palpi* consist of three separate members. These are very variable in length and direction as compared with each other in the various species. In most of the species, and these the typical genera of the family, the labial palpi are erect, somewhat recurved, reaching to or beyond the summit of the head. In some species they are weakly ascending, in numerous others they are horizontal or drooping; sometimes they are short, hardly more than one-half the head, in others long, equal in length to the head and thorax combined. Sometimes they stand rather widely apart; sometimes they are closely appressed together and beak-like. The members of these organs also differ very much as compared with each other. The basal member shows comparatively little variation, and is generally short. The middle member is the longest, the end member often the shortest. In some species the middle member is

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very much lengthened, becoming nearly or quite ten times as long as the end member. More rarely the end member is lengthened, so as to be nearly as long as the middle member. The shape of these members also varies; generally the middle member is flattened, cylindrical, even; sometimes, however, it is more or less triangular, considerably flattened, and often grooved on the inner side. The end member is ordinarily filiform, cylindrical, but it is often oval, sometimes oval conical. The vestiture of these organs varies in the quantity and length of the scales, differing very much in the different species. There is also some, but not very decided variation in these organs, in the sexes of the same species, though generally the sexes nearly agree.

MAXILLARY PALPI.—The *maxillary palpi* are very variable in form and ornamentation. There are also often very marked sexual differences. Ordinarily, if not always (I have found no exceptions so far as my studies have gone), they are four-jointed, the basal joint being small and difficult to make out, except in well bleached specimens, and with a compound microscope. The maxillary palpi are generally comparatively small, more or less concealed by the labial palpi, generally projecting forwards between the labial palpi, rarely rising above them. In many species the last two members are clothed with long hairs, giving a brush-like appearance. These are capable of expansion, but ordinarily lie concealed in a groove on the inner side of the second member of the labial palpi. So far as my observations go, the maxillary palpi are always present, though often very small. In properly bleached specimens, and with the use of a compound microscope, I have never found them absent in the many species I have examined. My examinations, however, owing to a lack of material, have not covered as yet all the American species.

The shape of the maxillary palpi varies oftentimes in the different sexes. When they do not differ, and in the female ordinarily, the basal joint is short cylindrical, the last three oval cylindrical, each one being on the extreme end or point of the one next below. In the case of the brush tufted maxillary palpi these are found fully developed in the males only, though there is generally in the females of the same species a more or less apparent tendency in the same direction. In the full development the first and second members are long, filiform, elbowed with each other when at rest, capable of being extended in a line with each other at the will of the insect.

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The two end members are oval cylindrical or conical, the last one never on the extreme end of the penultimate member, but on one side, never so far as to be joined at the base and thus geminate with it upon the summit of the antepenultimate member. The hair brush is always on the last member, is always more or less developed on the penultimate, and there always more strongly, as the point of union with the end member retreats from the extreme summit. Where the point of union is near the base the maxillary palpi become almost, if not quite equally bitufted, exactly reproducing the structure and ornamentation of certain of the Epipaschiidæ.

TONGUE.—The *tongue* is generally present, though sometimes entirely wanting. Where it is longest, it is nearly as long as the thorax and abdomen; it is with rare exceptions, if any, horny, rolled and scaled in front at the base.

I have noticed in many cases a decided difference in this organ between the Phycitidæ and the Geometridæ, though I have not sufficiently observed to warrant any generalization upon it as a family distinction. In the Geometridæ the extreme end of the tongue is furnished with minute, upright, cylindrical papillæ, equal in length to about one-third the diameter of the tongue itself. In the Phycitidæ, in all specimens examined, these papillæ do not exist, and are replaced by overlying laminæ.

There is also in the Phycitidæ a reciprocal relation between the tongue and the palpi, both labial and maxillary, which, though not universal, suggests some affinity which is of interest. In the great majority of cases where the tongue is strongly developed, the labial palpi are comparatively small and generally erect; in the most of cases where the tongue is weak or wanting the labial palpi are exaggerated in length, and are more or less horizontal. Even in exceptions the tongue, though long, is generally less horny where the palpi are long and horizontal. The tongue is generally best developed in those species which have the tufted maxillary palpi, and the occurrence of this development is rare where the tongue is weak or wanting. On the one side is shown a strong tendency to the structure of the Epipaschiidæ, on the other to that of the Crambidæ. Apart from these tendencies this reciprocal relation of these organs is to me of very great interest.

FRONT.—The *front* is generally somewhat quadrate, generally, though not always longer than broad and rarely quite narrow. The clypeus is generally flattened or slightly rounded, rarely grooved and

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rarely furnished with an embossed, or a long, sharp, conical tubercle. The vestiture is sometimes smooth, of closely appressed scales, sometimes tufted with comparatively long, overhanging scales.

EYES.—The *eyes* are large, globular, prominent, naked. There is often a tendency to lashing, though it is never decided. There is in the eyes scarcely any variation in the family, so far as my observations go.

OCELLI.—The *ocelli*, though sometimes wanting, are generally present. In the most of cases distinct, in some instances scarcely existing. I am of the opinion that in some instances in a species where the ocelli are present, but very small, specimens may be found where they are entirely absent. There seems also a difference in the prominence of this organ in some cases in the sexes. The ocelli are situated back of the base of the antennæ and close to the edge of the eye.

ANTENNÆ.—The *antennæ* vary greatly in the species, and in the sexes. They are found in the various species pectinate, dentate, crenulate and ciliate, and are generally somewhat uniformly clothed with hairs or tufted. The antennæ of the males generally differ from those of the females, the latter being more simple and generally ciliate pubescent. The antennæ of the males are in many species distinguished by a structure peculiar to the family. This consists of a modification of the four or five members just beyond the first member above the base. In all cases where this exists there is apparently a pressing together of the members on their inner side, thus shortening them, and at the same time somewhat of a lengthening of the same members on the outer side, thus forming a concavity or arc in the antennæ. The members of the antennæ forming this bend are always more or less fused together, sometimes quite coalescing. At the same time, as it would seem by the pressing out and hardening of the juices, the upper extremity of each member in the bend is prolonged more or less into a chitinous, spine-like, protuberance. The inner portion of the bend also generally has an abnormal development of scales forming a tuft or ridge. Rarely there is another modification in the existence, in the place of the tufting, of a perpendicular filiform process or laminæ two or more on each segment.

The basal member is variable in form, generally broadly oval, sometimes rounded, lengthened cylindrical, and sometimes has a protuberance on the inner side, exactly corresponding in this respect

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with some species of the Epipaschiidæ. Rarely the member immediately above the base is notched, though generally short cylindrical. In length the antennæ have very little variation, the length being somewhat more than half the length of the fore wing. The number of segments varies in those I have observed from 48 to nearly 70, the larger number of species having 54 or 55.

THORAX AND APPENDAGES.—The *thorax* is generally slight, though in a few instances heavy and noctuiform. It is, so far as I know, never tufted above, though in rare instances in the male sex it has a brush of hairs in front on either side below. There is also in many species a tuft on either side, lying concealed between the second and third segments of the thorax behind the coxæ of the middle legs. The patagiæ are rather loosely scaled, not closely appressed, and with vestiture reach to the extremity of the thorax. The vestiture of the thorax is scaly, generally close and appressed, and rarely with any tendency to be mixed with hairs.

WINGS.—The *fore wings* vary considerably in shape. They are generally narrow, elongate and subparallel, but sometimes are rather broad and somewhat triangular or oval. There is much variation in the arching of the costa, the sharpness of the outer angles, and the direction of the inner margin. There is considerable difference of wing shape in the sexes. In the females the fore wings are often broader with more rounded angles and outer margin. The fore wings are almost always with two cross lines, varying somewhat in position and dividing the wing into three fields, a basal, middle, and outer. There are almost always one or two black spots at or near the end of the discal cell. Sometimes there is a cross ridge of raised scales near the basal line. There is rarely in the males a tufting of scales beneath the wing, along costa, near the base. More rarely this becomes a fold, and may conceal a brush of hairs. The wings at rest are folded about the abdomen, concealing the hind wings.

The *hind wings* are subtriangular, the anterior angle being generally quite distinct, the anal rounded or obsolete. There is sometimes a slight tendency to falcation below the anterior angle on outer margin. They generally vary little in coloring, the variation being only from dark fuscous to translucent or satiny white. There is rarely in the males a tuft or two of hairs near the base above. The pectination of the lower median, near base above, is sometimes nearly obsolete. The fringes are sometimes quite long and Tineid-like in appearance.

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The *fenulum* is a single spine in both sexes. In the male it rises from a rounded base, while in the female the base is flattened and the organ seems to consist of three or four spines fused together and continuing to the end as one. I have found only one or two instances where there was a real division of these parts.

VENATION.—The *venation* is exceedingly variable in the different species. The fore wings have 11, 10, or 9 veins. Vein 7 is always absent.

In the 10-veined species the additional vein lost is sometimes one of the subcostal series, then vein 8, and sometimes one of the median series, and then vein 5, as it seems to me. In the 9-veined species a vein is lost from both of the subcostal and lower median series. In the family, vein 9 is always stemmed on 8. Vein 6 is always near or at the anterior angle of the cell in American species, never stemmed with 8, and 3, 4 and 5 are near the posterior angle, with 2 rarely near, generally somewhat distant. Vein 1 is never furcate near the base, and vein 12 is always separate from the cell. In all cases the cell is closed, though often the cross-vein is weak. There is very little variation in the length of the cell as compared with the length of the wing and little more in its breadth.

The hind wings have 8, 7, or 6 veins, with three internal veins counted as one. When there are 7 veins only, the one lost is generally of the lower median series, and when 6 veins only, generally vein 8 as well; rarely the loss is of two veins of the submedian series. The internal veins are never furcate at the base; vein 2 is near the posterior angle, or quite far removed; veins 3, 4 and 5 are at or near the posterior angle, and veins 6, 7 and 8 at or near the anterior angle of the cell. Vein 8 always merges with the anterior margin of the cell, and 6 is sometimes in part stemmed with 7. There is considerable variation in the length of the cell as compared with the wing. Generally about one-half the wing, it is rarely very short, in one case not exceeding one-fifth the wing length. The cell itself is generally part open, the cross-vein rarely distinct. The cross-vein posteriorly runs often into vein 5, the submedian vein into 3 and 4, thus leaving a narrow opening between.

In almost all these veins of both wings there is considerable variation in position. In the fore wings 4 and 5 may be stemmed or separate; 10 separate, or stemmed with 8 and 9. Very rarely 3 is stemmed with 4 and 5. In the hind wings 4 and 5 are stemmed or separate, 3 sometimes stemmed with 4 and 5, and 7 and 8 may be

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stemmed or separate. In the individual species considerable variation exists, so that in the same species in the fore wings 4 and 5 may be joined or separate, and in the hind wings 7 and 8, and 3, 4 and 5 are subject to the same uncertainty of position.

So far as my knowledge goes after the comparative examination of very many individuals of the same species, I regard the venation pretty constant in the most of the species. I have seen scarcely any exception among those having 10 and 9 veins in the fore wings. The variation in fact is not very great any where. It is merely a reaching out in each direction from the average position. I know of no case where veins are in the same species long stemmed and separate; or well separated, and at all stemmed; but in many cases where the veins of the species are ordinarily short stemmed, specimens may be found where the veins are from a point, or really separate though close; and again, where the veins are ordinarily close, but separate, specimens may be found where they are short stemmed. The most variability is in 10 with 8 and 9 in the fore wings, and 3 with 4 and 5, and 7 with 8 in the hind wings; but 4 and 5 of both wings are not to be too much relied upon as being constant in position.

There seems to be more than usual a tendency to wide aberrations in venation. I have found two specimens where there were 12 veins in the fore wings, and one or two abnormal cases of stemming.

There is a very decided difference of opinion as to what vein is lost in the case of the obsolescence of one of the lower median series. Up to the time of Mr. Ragonot, the usual statement was that vein 5 was the one lost. This was the case in the Geometridæ, and the older systematists probably thought this as well true in the Phycitidæ. Mr. Ragonot, however, in his paper (Diag. N. A. Phyct. p. 2, 1887) says, speaking of the hind wings, "Vein 5 exists always, as the space between 5 and 6 is ever of the same breadth whether the median vein be trifid or quadrifid."

In this matter I agree entirely with Mr. Meyrick, who says the two veins become "coincident." The obsolescence of the vein, which ever it be, is not because it is dropped out, but because it is stemmed with its neighbor, and the stem is so long that the point of separation is carried beyond the edge of the wing; and while it is nearly true, as Mr. Ragonot says, that "the space between 5 and 6 is ever of the same breadth," it is entirely true that the union has carried the resultant through all its course further from 6. This is shown also

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from the fact that 3, which is rarely stemmed with 4 and 5, is very often stemmed with the resultant. It indeed makes little difference whether the vein be called 4 or 5 (the two veins being joined in one), so long as the writer's view is understood. For myself I prefer saying vein 5 is lost, as this brings the form of expression in line with what exists beyond question in other groups of the Lepidoptera, and is as fully a statement of the fact as to say vein 5 is the one that is present.

LEGS.—The *legs* are comparatively uniform. They are, however, found stout and very slender, short and long, closely and loosely scaled. There is some considerable difference in the comparative lengths of femora, tibiæ and tarsi. The coxæ and femora are always very much flattened, and the tibiæ generally slightly so; the tibiæ are rarely swollen, and then only slightly. The tibial epiphysis is present, is well developed, and is situated near the middle of the tibia. The middle tibiæ are armed at the lower end with a pair of spurs; the hind tibiæ have two pairs, the one pair at the lower end, the other near the middle, but somewhat varying in position. The tibiæ are never spinulated; the tarsi generally are, but there is a very gradual variation from hairs to spines. The tarsi are always five in number, the end one armed with two sickle-like claws with pad beneath at their point of union.

ABDOMEN.—The *abdomen* offers few peculiarities. It is ordinarily slender, cylindro-conical, rarely heavy and noctuiform. The segments are, so far as I have observed, never tufted above, nor on the side, though rarely in the male there is an anal tufting.

In a few species there is a peculiar development of spines on the penultimate segments beneath; they are not very long, are generally concealed by the vestiture, and have a backward curve. These, as yet, I have found only in the ♀.

There is also a much more interesting modification of the last segment beneath. Sometimes without any modification, it is in other cases more or less chitinized, with more or less stout supports, with a central carination and a development of tufts of long hairs; sometimes these are modified into filiform chitinous appendages. They are found in the ♂ only. Ordinarily they are appressed, and their structure lost in the surrounding vestiture, but with the abdomen bleached and moderately magnified, they are most beautiful and interesting, as well as distinct objects.

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GENITALIA.—The *genitalia* are very interesting in structure, and manifest some very decided differences. While showing decided variations from the typical forms, they are constructed on two very distinct patterns. In the one the lower plate is present, in the other it is entirely absent. In the one the uncus is a spine, broadly furcate basally; in the other it is a nearly semicircular plate edged with a chitinous ridge, and this with one or more teeth. The one is of the Epipaschiid pattern, and exists in all the species which, in a labial palpi, maxillary palpi, and otherwise have seeming Epipaschiid affinities. The other is found in the Crambid species, mostly tongueless and largely with long porrect labial palpi.

In all cases there are wide modifications; the uncus may be found single, bifid, or even multifid, the neck long or wanting. The harpæ may be merely lengthened flanges, or may be bilobed, or may become long slender spines; they are generally short, sometimes very long haired; often unarmed, sometimes spined at tip or on one lobe, and are with or without one or two spines at base. The lower plate is generally spatulate, but may be conical, truncate conical, or rounded. The anal orifice is also often armed with one or several long stout spines, and in one genus, *Eurythmia*, with a curious spiral arrangement of spined laminæ.

The genitalia of the ♀ are comparatively simple, exactly as in the Epipaschiidæ. There is a more or less developed extensile apparatus. The ovipositor may be extended considerably, and is armed with divergent bristles at the end.

EGG.—Very little is known of the *eggs* of the species. So far as known they are oval, rather flattened spherical, grooved above, flattened below.

LARVA.—The larval history of the larger portion of our distinctly North American species is unknown. So far as known, though superficially their habits are very different, yet there is in fact much general similarity. Some inhabit flowers, others are borers; some gather leaves together, others live in dried fruits, or flour and meal, but in nearly all cases I believe a silken case of varying pattern is built in which the larva lives, lying concealed by day and feeding by night. In many instances the larvæ are of great economic importance, some species being very injurious to orchards and forests both in Europe and America.

The larvæ have sixteen legs after the ordinary pattern. They are ordinarily nearly unicolorous in various shades of green marked

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only with darker points and spots, and are often quite translucent. The head is flattened, somewhat extended; the first abdominal segment with a cervical, then last with an anal shield; the body is cylindrical, the segments well marked, nearly smooth, furnished only with a few short, scattered hairs, set on very small warts or tubercles.

PUPA.—The *pupa* is without marked characteristics. It varies from dark green to cherry in color, is cylindrical with the wing-cases and segments distinctly marked. The pupation is, I believe, always in a cocoon, in the habitat of the larva, upon the surface of the ground, or rarely beneath the surface.

I take little interest comparatively in the guesses which are made of the ancestry of any group of the Lepidoptera. The Lepidoptera have existed so long, the changes have been so great, the insects themselves are so frail in structure and in their life forces, that any effort to trace ancestry from the insects themselves must, it seems to me, be of little value. On general principles we can suppose the earliest Lepidoptera were arboreal or aquatic, probably the latter. From the aquatic standpoint the Pyralidæ may be supposed in some of their genera to have representatives of very ancient standing, and so also from their habits as leaf-rollers and borers, it may be supposed that the Phycitidæ are of very ancient ancestry. Nevertheless, as I have had cases of reversion in specimens to the 12-veined forms, and as there is in fore and hind wings in the case of the less veined species a tendency to revert to the greater number, I think we must regard the 9- and 10-veined groups as departures from a more ancient type.

The Phycitidæ are seemingly very unequally distributed in our country. A few species only are cosmopolitan through the agency of commerce.

It must be borne in mind that comparatively little collecting has been done in the United States, but so far as we know the species in the wooded districts of the North, East and South, they are comparatively few in numbers. From what little results I have seen of collecting in subtropical S. Florida, I would suppose it to be rich in species, largely the same as those of the West Indies. The part of the country, however, so far as my knowledge goes, most prolific of Phycitid life, is that part which includes the more or less arid plains of Texas, New Mexico, Arizona and Southern California. In this part of the country, wherever there is a development of arborescent vegetation, the Phycitidæ are comparatively numerous. As an ex-

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ample, a correspondent in central Texas has collected Microlepidoptera for me for two or three years, and from him I have received over fifty species; these were all collected at light only. Very nearly one-half of all our species have been taken in Texas. The grassy plains of the central portion of the United States are, by necessity, poor in species. The great wooded country of the Northwest has been to a very little extent explored, but will probably be found a comparatively rich field for the collector.

As compared with the European fauna as found in Staudinger's List, and the recent descriptions of Mr. Ragonot, our fauna will be found to be comparatively very rich. The fauna of all Europe, Northern, Western and Central Asia and Northern Africa, includes about four hundred and fifty species, of which nearly half have been very recently described. As yet only about two hundred species have been described from North America, but very little collecting has been done, and when the field is as well explored as that of Europe we shall probably have a much larger number of species than has been found in the European fauna. Comparatively our fauna is much richer than is that of Europe in the Crambid species, and very much poorer in general in the species with tufted maxillary palpi, especially those that have seven veins only in the hind wings.

It is impossible as yet to make much of a comparison of the various faunæ comprised in North America. There is a pretty definite division into the Eastern, extending to the plains west of the Missouri; the Rocky Mountain, including Texas and New Mexico; and the Pacific, including Arizona. Southern Florida, has its own fauna, but is West Indian rather than North American. The fauna of mountainous Mexico is almost unknown. There seems to be no definite Arctic fauna; the species so far as I know them are simply the remnants of species found further south, and they are few in number. The family in North America is essentially a family of the hot arid table lands.

DETERMINATION OF GENERA.

In determining the genera following, I have rested in all cases possible upon a personal examination of the species recognized as the type of the genus. In both genera and species I have given the exact description of the author as far as possible, and have made changes only as they were found not to agree with the type species, or as they were incomplete. In the most of cases two or more speci-

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mens have been examined, all the parts having been carefully bleached. The European species typical of genera were all determined by Dr. Staudinger and Mr. Ragonot. The American species typical of Mr. Ragonot's genera I have, by his kindness, seen in the large majority of cases, though sometimes it was impossible to make dissections, and consequently in many cases I am able to add but little, if anything, to Mr. Ragonot's diagnoses.

In the determination of genera I have felt the need of larger series of the most of the species. I have therefore thought it best for the present to include all of Mr. Ragonot's genera, even though I am confident from tendencies in variation it will be found the number may have to be hereafter considerably lessened.

But on this same basis I have had to multiply genera in the Crambid Phycitidæ, so great are the structural differences, and so little is the material for comparison.

With regard to structure I have found in some respects the secondary sexual characters to be least subject to variation. Yet I dislike basing genera upon anything which is not common to both sexes. For this reason I prefer, as far as possible, to make use of the characters common to the sexes, and so emphasize the structure of labial palpi, tongue, venation and the common ornamentation in tuftings and scale ridges.

It is to be understood that reference is made only to American species in my determination of genera and species in all synopses, and it is also to be understood that when no reference is made to any special organ, it is of the normal structure of the family, if I am acquainted with it.

In the numbering of the veins, they are always numbered as if all were present. In this I follow the older authorities, considering it far preferable to Mr. Meyrick's method of numbering in regular order without regard to the obsolescence of one or more of those which are intermediate.

PHYCITIDÆ Rag.

Ento. Mon. Mag. xxii, 20, 1885.

Phycidi Guen., Index Meth. 70, 1845.

Phycideæ Zeller, Isis 1848, p. 583; von Heinemann, Pyr. p. 145, 1865.

Phycidæ Walk., C. B. M. pt. 27, p. 22, 1863; Grote, Bull. U S. Geol. Surv. Terr. iv, 692, 1878; Meyrick, Proc. Linn. Soc. N. S. W. iii, 200, 1878; vii, 155, 1882.

Pyralidæ with hair pectination on lower median vein of hind wings at base above; maxillary palpi not triangular scale tufted, and not lying closely appressed on labial palpi at base.

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Synopsis of Subfamilies.

Genitalia of ♂ with lower plate present; uncus more or less conical, with projecting posterior central spine.....PHYCITINÆ.
Genitalia of ♂ with lower plate wanting; uncus rounded, without projecting posterior central spine.....PEORIINÆ.

PHYCITINÆ Rag.

Synopsis of Genera.

1. Fore wings with 11 veins..... 2.
   " 10 " .....39.
   " 9 " .....43.
2. Hind wings with 8 " ..... 3.
   " 7 " .....29.
3. Labial palpi erect, or ascending..... 4.
   " porrect or drooping.....21.
4. Maxillary palpi of ♂ small, filiform..... 5.
   " pencil tufted ..... 18.
5. Antennæ of ♂ simple, or bent above base only ..... 6.
   " bent above base with overlapping appressed scale tufts in bend.....12.
   " bent above base with tuft of scales in bend .....13.
   " bent above base with ridge of teeth in bend..... **Ambesa.**
6. Hind wing cell very short, one-fifth wing.....**Piesmopoda.**
   " cell one-fourth or more..... 7.
7. Fore wings 4 and 5 stemmed ..... **Myelois.**
   " short stemmed or separate..... 8.
8. Hind wings 3, 4 and 5 separate.....**Rhodophæa.**
   " 4 and 5 stemmed ..... 9.
9. Antennæ of ♂ with projection at summit of basal member.....10.
   " with none .....11.
10. Fore wings with basal scale ridge above.....**Acrobasis.**
    " with none.....**Mineola.**
11. Hind wings cell short; antennæ crenulate pubescent .....**Phycitopsis.**
    " cell normal; antennæ thick, ciliate.....**Promylea.**
12. Fore wings with basal scale ridge above .....**Pinipestis.**
    " with none .....**Dioryctria.**
13. Fore wings 4 and 5 long stemmed .....14.
    " separate, or very short stemmed.....15.
14. Hind wings cell normal; ♂ with anal tuft.....**Dasypyga.**
    " very short; ♂ without anal tuft.....**Tacoma.**
15. Hind wings cell normal; one-half wing.....16.
    " short, one-third or less.....17.
16. Fore wings with basal scale ridge above..... **Ortholepis.**
    " with none .....**Glyptocera.**
17. Fore wings with basal scale ridge above.....**Tlascala.**
    " with none.....**Nephopteryx.**
18. Fore wings 4 and 5 stemmed.....**Meroptera.**
    " separate.....19.

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19. Hind wings cell short, one-third length..... **Laodamia.**
" normal; one-half length.....20.
20. Fore wings very narrow; no thoracic tufts below ..... **Elasmopalpus.**
" as usual; hair tuft on each side thorax below between second and third segments..... **Salebria.**
21. Maxillary palpi of ♂ small filiform. .....22.
" pencil tufted ..... **Etiella.**
22. Antennæ of ♂ bent above base with tuft of scales in bend. .....23.
" simple, or bent only .....25.
23. Fore wings 4 and 5 separate..... **Pyla.**
" " stemmed .....24.
24. Hind wings cell normal; 2 near angle..... **Nelagia.**
" " short; 2 distant from angle..... **Sarata.**
25 Thorax of ♂ with long tuft of hair on each side below..... **Epischnia.**
" with none.....26.
26. Labial palpi porrect, very long; end member long .....27.
" generally drooping; short.....28.
27. Hind wings 4 and 5 long stemmed..... **Hypochalcia.**
" " separate..... **Pima.**
28. " " stemmed..... **Megasis.**
" " separate..... **Lipographis.**
29. Antennæ bipectinate in both sexes..... **Melitara.**
" not bipectinate.....30.
" simple, or bent above base only.....31.
30. " bent above base with tuft of scales in bend.....38.
31. Labial palpi erect, or ascending..... 32.
" porrect, or drooping..... **Zophodia.**
32. Maxillary palpi of ♂ pencil tufted..... **Staudingeria.**
" not.....33.
33. Fore wings of ♂ with tuft of hairs on costa below near base..... **Vitula,**
" without tuft below.....34.
34. Fore wings with basal scale ridge above..... **Seneca.**
" with none.....35.
35. Fore wings 4 and 5 long stemmed.....36.
" " separate, or from a point..... **Heterographis.**
36. Hind wings cell short, one-third wing..... **Lætilia.**
" " normal, one-half wing. .....37.
37. " 3 and 4 long stemmed..... **Honora.**
" " separate or short stemmed ..... **Euzophera.**
38. Palpi erect ..... **Canarsia.**
" porrect long..... **Dolichorrhinia.**
39 Hind wings with 7 veins..... 40.
" " 6 " ..... **Moodna.**
40. Fore wings 5 present, 8 wanting.....41.
" 5 wanting, 8 present ..... **Diviana.**
41. Hind wings 3 and 4 long stemmed..... **Ephestiodes.**
" " separate, or very short stemmed.....42.
42. Fore wings of ♂ with tuft on costa below; antennæ of ♂ not notched. **Manhatta.**
" with no tuft; antennæ of ♂ with member above base notched. **Homœosoma.**

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43. Hind wings with 7 veins.....44.
" " 6 " .....47.
44. Tongue long.....45.
" very short .....46.
45. Ocelli present; palpi porrect; hind wings 3 and 4 separate.....**Unadilla.**
" wanting; palpi erect; hind wings 3 and 4 stemmed...**Eurythmia.**
46. Palpi erect.....**Tampa.**
" porrect .....**Bandera.**
47. " erect.....**Ephestia.**
" porrect.....**Plodia.**

MYELOIS Hüb.

(Type *cribrella* S. V.)

Verz. p. 371, 1816; Zeller, Isis 1839, p. 176; 1846, p. 729; 1848, p. 585, 681; Herrich-Schaeffer, Sys. Bear. iv, 95, 1849; von Heinemann Pyr. p. 178, 1865; Meyrick, Proc. Linn. Soc. N. S. Wales, iii, 211, 1878; vii, 155, 1882; Ragonot, Ento. Mon. Mag. xxii, 19, 1885.

Oncocera Steph., Brit. Ento. p. 313, 1834.

Lispe Treits., Schmet. Eur. ix, 1, 204.

Myelophila Treits., Schmet. Eur. x, 3, 174, 1835.

Labial palpi erect, recurved, equalling summit; second member twice the length of third member; maxillary palpi short, filiform; antennæ ciliate, pubescent; ocelli present, distinct; tongue long, strong; legs all tarsi spinulated; fore tibia equals upper tarsus, hind tibia equals three times upper tarsus; upper spurs of hind tibia below middle; fore wings various in form; genitalia of ♂ uncus bifid at point; harpæ large, not spined; lower plate pointed, oval, spinous haired along outer edge. Venation: fore wings 11 veins, 4 and 5 stemmed, 10 separate; hind wings 8 veins, 2 distant from angle, 3 stemmed or separate, 4 and 5 long stemmed.

Synopsis of Species.

1. Color reddish .....**duplipunctella.**
" gray..... 2.
2. One or both cross stripes without black margin..... 3.
With such margins ..... 5.
3. Cross lines nearly obsolete, color uniform gray.....**obnupsella** n. sp.
Cross lines distinct; color lighter on middle field..... 4.
4. Lines broad; outer line round at middle: middle field light gray on disc. **bistriatella.**
Lines narrow; outer line angled at middle; middle field lighter gray. **bilineatella.**
5. Hind wings dark fuscous.....**zonulella.**
" light fuscous; translucent..... 6.
6. Middle area with white longitudinal dash near middle..... 7.
With no white dash..... 8.
7. Outer line sharply dentate.....**alatella.**
" nearly even.....**coniella.**
8. Outer line very indistinct..... 9.
" distinct.....10.
9. Outer line straight; size ordinary.....**subtetricella.**
" angulate; size small.....**minimella.**
10. Nearly uniform gray; discal spots indistinct points...**immundella** n. sp.
Basal half whitish, outer dark; discal spot large oval..... **hystriculella.**

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1. **M. bistriatella** Hulst, Ento. Am. iii, p. 136, 1887 (*Dionyctria*).—Expands 18 mm. Head and thorax fuscous gray. Abdomen fuscous, the segments narrowly black in front. Fore wings fuscous gray, or blue fuscous gray. Base lighter anteriorly. Basal line straight, a little outwardly oblique, whitish, somewhat broad and diffuse, less distinct costally, pure white towards inner margin, forming there a lengthened white spot; it is shadowed outwardly by a broad dark, fuscous band. The wing lightens beyond disc, and reveals two black discal points one preceding the other, somewhat confluent. Outer line whitish, slightly bent, subparallel with base, shadowed broadly, both sides with dark fuscous. A row of black points on margin. Hind wings light fuscous; fuscous at apex, with black marginal line. Beneath dirty fuscous on fore wings, apex and anterior part of hind wings, otherwise very light.

Washington, D. C., Fla.

In this insect the costa is strongly arched, the angles well rounded. Mr. Ragonot, in his Cat. N. A. Phycitidæ, Ento. Am. v, 115, refers this as a synonym of *Salebria tenebrosella* Hulst, but the reference is beyond peradventure incorrect.

2. **M. subtetricella** Rag., Ento. Am. v, 113, 1889.—Expands 18—22 mm. Fore wings elongate-oval, very narrow at base, strongly rounded on costa, dark gray, much suffused with brownish, glossy; first line broad, oblique, straight, gray, indistinct, edged outwardly by a shadowy blackish line; second line hardly perceptible, oblique, straight, very narrow, hardly paler than ground color. A dark spot, hardly distinct on disc; hind wings transparent, whitish, smoked on margin; very near to *tetricella* F.

North America; exact locality unknown.

3. **M. immundella** n. sp.—Expands 20—21 mm. Labial palpi short, dark gray, blackish at tip; front gray; antennæ fuscous, annulated with gray. Thorax dark gray, lighter across middle, darker behind. Abdomen fuscous ochreous; fore wings arched at costa, apex sharp, outer margin oblique, inner slightly sinuate; color almost even, blackish gray; first line near base broad, distinct, twice waved, edged outwardly with black; outer line narrow, distinct, close to outer margin, starting from inner angle, dentate wavy, edges hardly darker. Discal spots nearly obsolete; middle of middle field along inner margin with a darker, nearly black spot. Hind wings light translucent, veins and border fuscous.

Texas.

4. **M. bilineatella** Rag., Diag. N. A. Phyc. p. 3, 1887.—Expands 20 mm. Fore wings short, costa strongly rounded, gray, washed with blackish, except in median area; transverse lines distinct, whitish, the first nearly straight, the second slightly oblique, with a short angle in the middle. Discal spots pretty distinct. Hind wings yellowish.

North America; exact locality unknown.

5. **M. zonulella** Rag., Ento. Am. v, 113, 1889.—Expands 22 mm. Fore wings hardly dilated posteriorly, pale blackish gray, darker in median area, lines pale, edged with black, the first oblique, straight, extending nearly to the middle

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of the inner margin, very broadly edged with black on the outside; second line oblique, sinuous. Discal spots indistinct black. Hind wings blackish brown-gray. Smaller than *bilineatella*, the costa and inner margin nearly parallel, its hind wings much darker.

Northern Illinois. Types in Brit. Museum in coll. of Mr. Grote.

6. **M. obnupsella** n. sp.—Expands 23 mm. Palpi. head, thorax and abdomen slightly lighter than the rest. Fore wings extended, narrow, angles rounded, the inner obsolete, giving the wing a long oval shape; color, an even mouse-gray; lines hardly discernible, the first evidenced by a scattering of light gray scales across the wing, the outer by similar scales near costa; fringes concolorous. Hind wings light fuscous, veins and margin darker.

Canada, Florida.

7. **M. minutulella** Hulst, Ento. Am. iii, 136, 1887 (*Dioryctria*).—Expands 13 mm. Head, body and fore wings even dark gray, consisting of black ground dusted quite evenly with white scales. Fore wings pointed at apex, strongly arched, inner line white, nearly straight, edged outwardly with a distinct black band. Two black discal points. Outer line faint, fine, angulated, very oblique. Hind wings fuscous, blackish gray along anterior margin. Beneath, fore wings dark fuscous, hind wings light fuscous.

Texas.

This insect is placed by Mr. Ragonot in his Catalogue N. A. Phycitidæ as a synonym of *Eurythmia hospitella* Zell. It very much resembles some specimens of that species in general appearance, and I may have inadvertently made a mistake in determining what I sent Mr. Ragonot. The type in my possession is a *Myelois*.

8. **M. alatella** Hulst, Ento. Am. iii, 135, Oct., 1887 (*Acrobasis*); *rectistrigella* Rag., Diag. N. A. Phyc. December, 1887 (*Myelois*).—Expands 18--22 mm. Palpi dark gray, white in front, fuscous at tip. Head and thorax fuscous gray. Abdomen fuscous anteriorly, ocher fuscous posteriorly. Fore wings narrow, strongly arched on outer third, apex rounded, outer margin oblique, inner angle rounded, light gray in color, much marked with fuscous. Posterior portion of basal field fuscous. Basal line white, rounded, and extending outwardly towards inner margin, edged outwardly with black. Middle field with anterior half dusted with fuscous, posterior half fuscous, with a longitudinal white dash between the two portions. Outer line oblique from towards apex, faint, diffuse, edged with indistinct diffuse fuscous. Outer field heavily dusted with fuscous. Fringes gray. Hind wings light fuscous, becoming fuscous at tip, subpellucid. Beneath, smooth, even fuscous on fore wings; hind wings as above.

Arizona, New Mexico, California.

9. **M. coniella** Rag., Diag. N. A. Phyc. p. 2, 1887.—Expands 21 mm. Fore wings narrow, rounded on costa, pale gray; an ochreous spot on inner margin at base; first line white, very oblique, its distinct black margin connected with a shadowy line, which crosses obliquely the median area; second line approximate to hind margin, indicating by its shadowy blackish margin. Discal spots distinct. Hind wings translucent yellowish white.

Nevada, California, Arizona.

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This insect is very close to the preceding, and both being somewhat variable in ornamentation, are likely only forms of one species.

10. **M. duplipunctella** Rag., Diag. N. A. Phyc. p. 2, 1887.—Expands 18 mm. Fore wings reddish gray, costal half of median area white. First line white, broad, not reaching inner margin, followed by a black band, which is very narrow on costa, wide on dorsal fold: second line whitish, lined on each side with blackish, with an acute angle in middle. Discal spots distinct.

Florida.

11. **M. hystriculella** Hulst, Ento. Am. iii, 135, 1887 (*Acrobasis*); *histriculella* Rag. Cat. Ento. Am. v, 114, 1889 (*Rhodophæa*).—Expands 18--20 mm. Head parts smoky fuscous. Thorax smoky fuscous on sides and front, ocher fuscous on dorsum and posteriorly. Abdomen yellow fuscous. Fore wings light gray, powdered with fuscous; extreme base fuscous. Outer basal field with two short, longitudinal black dashes, one at the middle of wing, the other near anal margin, these edged more or less distinctly with white. Basal line well out, twice dentate outwardly, shadowed narrowly with black on both sides. On middle field a large, faint, fuscous, oval, discal spot, with white center; outer posterior middle field fuscous, extending across outer line over the whole outer field, though less marked along margin. Outer line even, curved outwardly, shadowed on both sides. A marginal line of confluent, dentate, black points. Hind wings light ocher fuscous, with black marginal line. Beneath fuscous on fore wings hind wings as above.

Texas.

This insect, catalogued under *Rhodophæa* Guen. by Mr. Ragonot, is correctly placed as above. It corresponds in venation exactly with the typical *Myelois*, as well as in other structural characters.

RHODOPHÆA Guen.

(Type *advenella* Zinck.)

Ann. Soc. Ento. France, 1845, p. 312 (Index Meth. p. 74), Rag., Ento. Mon. Mag. xxii, 19, 1885).

Labial palpi erect, recurved, rather short; maxillary palpi small; tongue strong; ocelli distinct; antennæ simple, pubescent; legs short, stout. Venation fore wings, 11 veins, 4 and 5 separate, 10 separate; hind wings 8 veins, 2 distant from angle; 3, 4 and 5 separate.

Here, as often elsewhere, the relative position of 7 and 8 is not spoken of, as I have found them to be entirely variable in the same species.

1. **R. pallicornella** Rag., Diag. N. A. Phyc. p. 3, 1887.—Expands 19 mm. Fore wings broad, outer margin obtuse, costa straight, gray, suffused with blackish posteriorly. First line broad, dark red, lined with black on both sides; second line grey, sinuous, produced and rounded in the middle, distinctly lined with black. Hind wings brownish yellow; antennæ yellow.

Texas.

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2. **R. exsulella** Zell., Isis 1848, p. 868.—Expands about 20 mm. Head clear lemon-yellow, brown about eyes; antennæ brown; tongue shorter than usual; legs light violet gray; abdomen brown, annulated with yellowish; fore wings costa arched, apex not sharp, color violet-gray; first line white, rather wide, on inner side a deep red band not reaching costa; outer line faint gray; discal points nearly obsolete.

Zeller says he received this insect from Zimmermann. Elsewhere he gives locality of what Zimmermann sent as "Georgia, Carolina," so that is likely the habitat of the species. I do not know the species. Mr. Ragonot is authority for the reference.

ACROBASIS Zell.

(Type *tumidella* Zinck.)

Isis 1839, p. 176; 1846, p. 731; 1848, p. 585, 606; Herrich-Schaeffer, Sys. Bear. iv, p. 99, 1849; Von Heinemann, Pyr. p. 175, 1865; Grote, Bull, U. S. Geol. Surv. Terr. iv, p. 692, 1878; N. A. Ento. i, 10, 1879; Ragonot, Ento. Mon. Mag. xxii, 19, 1885.

Labial palpi erect, recurved; maxillary palpi distinct; tongue long and strong; ocelli present; antennæ simple, the basal member with a protuberance on inner side at summit crowned with a pointed scale tuft; fore wings with basal cross-ridge of scales above, more or less developed. Genitalia of ♂ (*comptoniella*) uncus rather long, spine long, trifid at point, bifid at base; harpæ broad, long, not spurred at base; lower plate broad, conical, with inturned bristles on outer edge. Venation: fore wings 11 veins, 4 and 5 separate, 10 separate; hind wings 8 veins, 2 distant from angle, 3 separate, 4 and 5 very short stemmed, rarely separate; cell short.

Synopsis of Species.

1. Fore wings with red basal cross-line ..... 2.
   " without ..... 4.
2. Hind wings beneath with one or more black dashes in ♂.
   angusella.
   nigrosignella n. sp.
   Hind wings with none ..... 3.
3. Larval case oval globular ..... **comptoniella** n. sp.
   " extended, horn-shaped ..... **rubrifasciella.**
4. Hind wings with one or more black dashes beneath in ♂ .... { **caryæ.** **demotella.**
5. Head, thorax, and base of fore wing white. ..... **palliolella.**
   " " " " not white ..... 6.
6. Fore wing dark blue-gray ..... 7.
   " not ..... 8.
7. Head reddish ..... **caryivorella.**
   " blackish gray ..... **gulosella** n. sp.
8. Fore wings dark gray washed with violet ..... **betulella** n. sp.
   " ocher fuscous ..... **hebescella** n. sp.

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1. **A. palliolella** Rag., Diag. N. A. Phyc. p. 4, 1887; *albocapitella* Hulst, Ento. Am. iv, 116, 1888.—Expands 18 mm. Fore wings broad, arched near base; gray, strongly washed with blackish brown and reddish, the costal half of the basal area white, the rest flesh colored. First line very oblique, reddish, edged with blackish posteriorly, preceded by a straight line of raised blackish scales. Second line grayish, edged with black, slightly sinuous; discal spots distinct.

My species, *albocapitella*, seems to differ materially from this description, but Mr. Ragonot has seen my type, and pronounces it the same as his *palliolella*. My original description was as follows:

Expands 14 mm. Palpi, head and thorax snow-white; abdomen white, slightly stained with fuscous; fore wings white at base, with a faint reddish fuscous stain along costa and inner margin; basal line dark brown, rather indistinct; wings beyond fuscous gray, except along basal line on inner margin, which is whitish; outer line gray, indistinct, rounded in middle outwardly, edged within with dark brown; veins slightly darker than ground color; hind wings pellucid fuscous, darker outwardly.

Canada.

Mr. Ragonot gives no locality.

2. **A. caryævorella** Rag., Diag. N. A. Phyc. p. 4, 1887.—Expands 23 mm. Fore wings broad, strong, rounded on costa and hind margin, dark bluish gray, nearly black; lines dark gray, edged with black, the first straight to median vein, then oblique to costa, preceded by a line of raised scales; second line sinuous, indented on the folds, rounded and dentate in the middle. Discal spots distinct. Hind wings fuscous, head reddish.

Missouri.

I do not know this species.

3. **A. angusella** Grote, N. Am. Ento. i, 51, 1880; Papilio i, 14, 1881; Bull. U. S. Geol. Surv. Terr. vi, 590, 1880; *minimella* Rag., Ento. Am. v, 113, 1889.—Expands 22 mm. Head and thorax very pale reddish. Basal field limited by the curved anterior line, pale reddish; a blackish shade before the line, resting on internal margin, and followed by a red shade; median space fuscous. Discal dots separate. Posterior line denticulate and exserted over median nervures, indented below costa and on median fold, followed by a reddish shading. Hind wings smoky, subpellucid; beneath with two thick, black, basal dashes, one on costa the other along median vein; fore wings fuscous beneath, pale along costal region at base.

New York.

Mr. Grote further says this species has been bred by Mr. Akhurst, of Brooklyn, from larvæ boring into the leaf stems of the hickory (*Carya* sp.). Mr. Akhurst has told me the work of the larvæ is very observable in the spring, for every young sprout bored into withers away and dies. Often trees have a dead appearance in view of the ravages of this insect.

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4. **A. demotella** Grote, Papilio i, 14, 1881; Bull. U. S. Geol. Surv. Terr. vi, 590, 1880.—Expands 24 mm. Fore wings fuscous; base pale, stained with reddish, with an ashen shade on internal margin in place of the usual scale ridge; outer line obliterate, pale, sinuate, not dentate as in *angusella*, followed by a vague reddish shade. Head and thorax whitish, with a faint reddish tinge. Hind wings pale fuscous, with paler fringes. Beneath the hind wings have two black dashes one median the other costal, not reaching base; head and thorax nearly white.

New York.

Prof. Fernald, in connection with his work at the Hatch Experiment Station of Massachusetts, has bred the larva. He has kindly given me permission to use the description, which was briefly written by his assistant: "Larva on Black Walnut boring into the ends of twigs. Length 11 mm. It is cylindrical in shape, tapering to both ends from the middle. Head rounded, shining dark brown, clypeus angulate, somewhat V shaped. Antennæ yellowish white, tipped with brown. Mandibles glistening dark brown, a few dark brown hairs scattered over the surface of the head. The general color of the body is dark olive-brown, of the thoracic plate shining dark brown. On each segment subdorsally, laterally, and stigmatally is a minute brown tubercle or piliferous spot from which arises a hair. Spiracles oval, light brown; anal shield dark shining brown, with a few scattered hairs. Legs and prolegs brown. One pupated May 20th, and emerged June 2d. Another pupated June 7th and emerged June 16th."

5. **A. caryæ** Grote, Papilio i, 13, 1881; Bull. U. S. Geol. Terr. vi, 590, 1880.—Expands about 20 mm. Shining gray fuscous, the head and thorax concolorous, smaller than *angusella*, without the carneous shadings and reddish thorax and head. Outer line of the primaries pale, narrow and faint. Inner line a ridge of raised darker scales, narrowly edged outwardly by a pale flesh-colored shade. The wing is paler, more greenish at base. Discal points faint. In ornamentation this species is inconspicuous. Hind wings as usual, blackish; fringes interlined, concolorous.

Reared by Mr. Coquillett from larvæ on *Carya porcina;* the larva has been found boring into the twigs.

LARVA.—Mr. Coquillett describes the larva as follows: "Body cylindrical, smooth, pale greenish ash; a pale brown subdorsal dot on each side of segment 2; a wavy fold below the spiracles; the latter are encircled with a dark brown ring, and there is a brown, piliferous dot over each; a few whitish hairs on each side of the body; top of segment 1 polished, yellowish green; head narrower than segment 1, heart shaped, dark brown; venter pale green, un-

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marked; sixteen legs. Length 14 mm. Found May 21st burrowing in the branches of the Pignut Hickory (*Carya porcina*), usually selecting the lower branches; imagos about June 22d.

"Pupa of the usual form, pale brown, rounded at posterior end, at which place there is a cluster of about four slender hooked spines. Length 7–8 mm. The larva spins a thin web around the footstalks of the leaves which grow near the terminal end of the branch, and then burrows into the terminal bud, and the wood of the present year's growth. It webs its castings together and forms a short tube which projects outward from the mouth of its burrow, and is closed at the outer end. The larva probably assumes the chrysalis form in its burrow, but those I reared deserted their burrows, and spun tough cocoons beneath the litter in the bottom of the breeding-cage."

Mr. Grote does not give the habitat of the insect, but Mr. Coquillett was at the time, if I am not mistaken, residing in Illinois.

6. **A. nigrosignella** n. sp.—Expands 16 mm. Labial palpi light maroon-red in front, fuscous behind and at tip; front reddish; antennæ dark fuscous; thorax dark fuscous, washed with deep violet reddish; abdomen fuscous ochreous, the anterior segments darker dorsally, with reddish brown: fore wings short, broad, costa arched, apical angle distinct; color light gray, much overlaid with blackish, especially at base, in middle field along costa beyond basal line (here forming a large, triangular patch) and on outer field; lines rather indistinct, the first straight, even light gray, edged outwardly with scale ridge, which is bright reddish with black in middle: outer line very indistinct, nearly lost in dark outer field, very close to outer margin; discal spots separate, distinct; base of wing somewhat reddish. Hind wings fuscous. Beneath fore wings dark fuscous, lighter along inner margin, with a costal black stripe reaching from base to middle; hind wings even yellow fuscous, with costal black stripe from base to just beyond middle.

Texas.

In these descriptions I have given all I find on record of the forms which I think ought to be grouped under the one species, *A. angusella*. Prof. Fernald, by the specimens bred by him and which I have examined, demonstrates the fact that the black dashes below are sexual, and are found in the male only. The specimens which I have seen vary among themselves in the matter of the reddish color on fore wings, and the number and extent of the black dashes below on hind wings. I do not believe, in view of the variability, there is more than one species. *Minimella* was described from a ♀, and differs in nothing, except smallness of size from *angusella*, but this difference is not unusual. Whether the forms be species or va-

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rieties there ought to be some way of designating the different forms, and I would thus distinguish them:

1. Hind wings with one or more black dashes beneath in ♂ ..... 2.
   " without black dashes beneath; fore wings without reddish band above..... *caryæ.*
2. Fore wings above with reddish band..... ..... 3.
   " without reddish band; hind wings with two black dashes. *demotella.*
3. Hind wings with two black dashes beneath..... *angusella.*
   " with one only..... *nigrosignella.*

I am as certain as I can be from a description, without seeing the insect, that *caryævorella* Rag. given above is also a synonym of this insect. If he had the ♂, and it had no dash below, then a synonym of *caryæ;* if he had the ♀ only, then of that, or of *demotella.* But as I have not seen the insect I give the name the benefit of what doubt there is.

7. **A. rubrifasciella** Pack., Ann. Lyc. Nat. Hist. N. Y. x, 267, 1873; Grote, Bull. Geol. Surv. Terr. iv, 693.—Body and wings slate-ash, glistening; thorax tinged with reddish brown and with the head giving off faint metallic colors: palpi blackish on the outside. Fore wings rather broad; just within the basal third a straight line of raised scales, extending from inner edge, and stopping short of the subcostal vein, conspicuously black externally, concolorous with the wing within; the black line is bordered with vermillion (sometimes wanting), which usually reaches the costal edge. Base of wing slightly paler than middle of wing. A light triangular paler shade in the costal region of the middle of the wing, enclosing the two black discal spots. A submarginal faint narrow line, curved outward in the middle, with four or five acute scallops. Fringe concolorous with rest of wing. Hind wings pale glistening cinereous. Beneath, fore wings quite dusky with no markings; hind wings much paler, growing darker towards the costa Legs dark ash, paler at the end of the joints, especially the hind tibiæ, which have a whitish band around them; hind legs whitish within (Packard).

Dr. Packard says, "the larva lives in June and early in July between the leaves of the Alder (*Alnus*), where it makes a horn-shaped case of black cylindrical pellets of excrement, arranged regularly in circles, the additions being made around the mouth of the case. The case is about an inch and a half long; its mouth is a quarter of an inch in diameter; within it is densely lined with white silk.

The pupa is of the usual color, mahogany-brown, the end of the abdomen rounded, with six hairs projecting from a supra-anal projecting ridge. On each abdominal segment is a dorsal dusky transverse stripe, widest on the basal segment. The pupa state lasts about two weeks, the moth which I reared appearing July 24th, the larva having been found July 6th."

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Mr. Beutenmüller, having raised the larva, gives me the following description:

"Head deep chestnut-brown, rugose; mouth-parts whitish; cervical shield chestnut-brown, divided in the middle by the color of the body, which is brown, with a pinkish hue. On each side of the body are scattered a few minute piliferous spots each bearing a light brown hair; on each side of the first and second segments a shining black spot. Thoracic feet black: abdominal feet concolorous with body. Length 13 mm. Larva taken May 30th, emerged June 17th."

8. **A. comptoniella** n. sp.

Extremely like *rubrifasciella* Pack., and indeed I can find no point of distinction in the imagines. The insect is, on the average, somewhat larger, and more robust, with the wings slightly broader. The outer line is almost obsolete, as are the discal spots; the hind wings are generally darker.

Found in Maine, Massachusetts, New York; common near New York, feeding on *Comptonia asplenifolia* and *Myrica cerifera*.

LARVA.—Mr. Wm. Beutenmüller (Ento. Am. v, 38, 1889) gives the following description:

"Head chestnut-brown, mouth-parts pitchy-black. Body above dirty green with two rows of black piliferous spots on each side, and all bearing a light brown hair. Spiracles black; underside of body same color as above. Length 16 mm.

"Lives singly in a pyriform case made of frass between the terminal leaves of the branches of *Myrica cerifera*."

The case is more nearly broadly oval than pyriform, and is a thick and solid silk covering with a long flabby tube at opening. The case is about 20 mm. long by 15 mm. wide. In many instances two are spun together side by side the openings always in the same direction, the cases being unconnected within.

9. **A. betulella** n. sp.

Another insect very closely resembling *rubrifasciella* Pack., and also *comptoniella*. It differs, first, in having the most of the fore wings washed lightly with violet red; secondly in lacking the basal red cross-band entirely. The basal line is obsolete, and the outer line and discal spots distinct. Hind wings dark fuscous. Feeds on *Betula*, the imagos emerging late in June and early in July.

The larva I have not seen. The case, which afterwards becomes the cocoon, very closely resembles that of *A. comptoniella*. It is always a cleaner mass of silk not having fine pieces of leaves wound in with the outside. It may be only a variety of *comptoniella*.

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10. **A. hebescella** n. sp.—Expands 18—20 mm. Labial palpi blackish gray. Head ochreous fuscous, thorax dark fuscous. Abdomen ochreous gray, annulate with fuscous. Fore wings short, very broad, strongly arched on costa and inner margin, ochreous fuscous, quite dark; lines indistinct, basal hardly discernible, faintly gray, edged outwardly with black at costa; scale ridge black, short; outer line dentate, shown by black border lines on ground color; discal spots quite distinct, confluent. Hind wings dark even fuscous.

New Jersey, Texas.

A specimen from New Jersey, received from Prof. J. B. Smith, has on it a label marked "on oak, Jersey pines, June." The pin is thrust through an oval close cocoon which was undoubtedly made at or under the surface of the ground. The pupal skin within has six spines at the anal extremity, and is of a cherry-brown color, the spiracles darker.

I have myself found the larval cases of a Phycitid in southern New Jersey, on a large-leaved oak, which may be the cases of this species. They were horn-like, much resembling those of *indigenella*. The larva turned over the edge of the large leaf binding the edges, and forming a habitation large enough to move about freely within. The case itself was fastened within with threads of silk.

11. **A. gulosella** n. sp.—Expands 22 mm. Palpi blackish gray; front light gray; antennæ blackish; thorax gray. Abdomen light gray; fore wings even light gray, sprinkled thickly with black, giving a blue-gray appearance; lines distinct; basal broad, light gray, edged inwardly with a black scale ridge, outwardly with a scalloped black line; outer line zigzag with two strong dentations, light gray, edged inwardly with a black line; a rather heavy marginal line; discal spot oval, white; a black spot with raised scales at middle of middle field. Hind wings fuscous, darker at edges.

Hot Springs, N. Mexico. Taken in August at light.

MINEOLA* n. gen.
(Type *indigenella* Zell.)

The same as *Acrobasis*, except that the fore wings have no basal scale ridge above.

Heretofore the existence of a basal scale ridge on fore wings above has not generally been regarded as being of generic value in the Phycitidæ. My own opinion is, it is one of the best of generic characteristics. 1. It is a structural character. 2. It is of a kind with many others universally regarded of generic importance, *e. g.* the costal fold, the tuftings in the bend of the antennæ, the thoracic tufts, the tuft at the summit of the basal member in *Acrobasis* itself.

* An ancient tribe of Indians on Long Island, N. Y.

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It is true that as I have shown that this is the result of a protuberance on the member itself, but that fact was before unknown, and yet the generic importance of the mere tuft of scales was never questioned. 3. It is an easily observed character. 4. It is common to both sexes, which is a very important matter. 5. It is no more variable than venation and antennal vestiture. 6. I have not yet found a single instance in which it was absent and present in different specimens of the same species. As heretofore, I give for all genera the names of extinct, or likely to be extinct, Indian tribes of North America.

Synopsis of Species.

1. Fore wings with red basal cross-vein more or less complete.....2.
   " without this.....3.
2. Basal line strongly dentate.....**caliginella.**
   Basal line nearly straight.....**tricolorella.**
3. Fore wings with black line running from basal line at costa to centre of middle field at inner margin; larva in horn-shaped case....**indigenella.**
   Fore wings without this line.....4.
4. Fore wings light gray on anterior middle field; larva in berries without case. **vaccinii.**
   " not light gray.....5.
5. Fore wings dark dull fuscous, lines indistinct; larva in cylindric case smaller at both ends.....**juglandis.**
   " blackish, lines distinct.....**amplexella.**

1. **M. tricolorella** Grt., Bull. U. S. Geol. Surv. Terr. iv, 694, 1878 (*Acrobasis*).—Expands 20 mm. Fore wings blackish, shaded with whitish gray on terminal space outwardly, on costal region, over the fused discal points and on basal space. A broad white band before the anterior line. Below median vein this band is edged outwardly by a dusky shade line, and this is followed by a yellow red shade, before the outwardly oblique black anterior line. Outer line followed by a whitish shade, roundedly indented below costa, followed by the blackish ground color in terminal space, and this by the whitish gray terminal shading. A dotted terminal black line; fringes pale. Secondaries pale fuscous, with paler fringes. Beneath, fore wings dark; hind wings pale fuscous.

Maine, Nevada, California.

I can see no difference between the Eastern and Western specimens.

2. **M. amplexella** Rag., Diag. N. A. Phyc. p. 3, 1887 (*Acrobasis*).—Expands 15—17 mm. Fore wings short, costa slightly rounded, purplish fuscous, with a snowy-white costal patch enclosing the distinct black discal spots. First line snowy-white, oblique, rounded; second line dark gray, slightly sinuous, distinctly black margined on both sides. Hind wings fuscous.

North Carolina, Texas, Missouri.

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3. **M. caliginella** Hulst, Ento. Am. iii, 131, Oct. 1887 (*Nephopteryx*); Ento. Am. v, 156, 1889; *comptella* Rag., Diag. N. A. Phyc. p. 4, Dec. 1887 (*Acrobasis*).—Expands 21 mm. Head fuscous gray. Palpi black, with a few gray scales. Thorax gray in front, fuscous behind. Abdomen ocher fuscous, the segments darker anteriorly. Fore wings very much the color of *Phycita indigenella*, light gray on anterior portion of basal and central field, fuscous on posterior portion. Basal cross-line subparallel with outer line, twice dentate outwardly, clear white anteriorly, gray towards inner margin, shaded outwardly. Outer line gray, subparallel with margin, with large sinus outwardly near middle, faintly shadowed on both sides. Outer space fuscous, shading into gray towards margin. An interrupted row of black points on the margin with fuscous gray fringes not interlined. Hind wings light fuscous, with dark fuscous marginal line. Beneath dark fuscous on fore wings and at apex of hind wings, the latter otherwise light fuscous.

Arizona, California.

4. **M. vaccinii** Riley, Can. Ento. xvi, 237, 1884 (*Acrobasis*); Dept. Agric. Rept. 1884, 352; Smith, Dept. Agric. Rept. 1884, 394; Bull. iv, Dept. Agric. 1884. p. 28; Saunders, Ins. injurious to fruits p. 375, 1883.

Expands 14–16 mm. General color and appearance of *Acrobasis indigenella* Zell., but a somewhat smaller species with primaries usually narrower. It may be distinguished by the following differences as compared with *indigenella;* colors of a colder gray with less reddish brown or tawny on the inner portions of primaries, and with the pale costal parts nearly pure white, so as to contrast more fully with the dark shades, and to more fully relieve the basal branch of the forked shade on the inner part of the first or basal line, this basal branch being also usually darker than the outer or posterior branch. The triangular costal patch from the basal line is obsolete. The transverse pale lines are less clearly defined, and the terminal is nearer the posterior border of the wing, *i. e.*, the median field is wider. The geminate discal dots are always well separated and the inner one well relieved by the white which extends around it on the darker ground and often forms an annulus. The oblique shade from apex is less clearly defined.

Egg.—About 0.4 mm. long and 0.3 mm. broad; ovate or almost circular, and flattened or plano-convex, the form varying with the surface of attachment, to which, while plastic, it partly conforms. Color olive green or brown.

Larva.—Average length when full grown 10 mm. Convex above, flattened beneath. Surface of body minutely granulate, with a dull, somewhat greasy appearance. Color varying from greenish yellow to olive-green, reddish or brownish, being generally darkest towards the anal end. Head yellow, polished, somewhat lighter towards the mouth, with the sutures of the clypeus slightly brown, and the anterior angles of the head distinctly so; labrum, antennæ and

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palpi white; mandibles yellowish at base, becoming blackish toward tip; ocelli black; cervical shield somewhat paler than the head, almost colorless anteriorly, its median line scarcely paler, without any markings, except a brownish or blackish wart a little in front, above the stigma. Anal plate of the same color; stigmata extremely small, except first and last pair, oval and pale brown. Piliferous warts only about half the size of stigmata, very pale brown and polished, each supporting a fine hair of a faintly yellowish color, of which those on the posterior row of warts are much the longest, and are directed forward; similar long hairs are also on the head, thorax, around the margin of the anal plate, and along the sides of the body. Legs concolorous with the body.

PUPA.—Average length 7 mm. Brownish yellow; stigmata brown. A dorsal, dark brown, transverse band, anteriorly on last joint; tip broad, almost straight, having a small tooth at each angle, and along its inferior edge four fine, yellowish brown bristles, twisted and directed forward. Abdomen slightly punctate (Riley).

Mr. J. B. Smith, who discovered the moth, studied its habits and ascertained its life-history, reports upon it in summary as follows: At Cape Cod, Mass., the imagines were found flying from July 10th to 16th. The eggs were laid upon the partially grown berries of the cranberry. No eggs were laid on blossoms or very young berries. One egg is laid on a single berry. The egg state lasts from six to eight days; the young larva hatching, spins a few threads as supports, eats for a day or two on the outside and then burrows into the berry. It eats out one, then goes to another, often ruining three or four in a season. It generally leaves the berries for pupation in September and October, though a few remain later. It pupates under the ground, forming a cocoon of silk covered with earth. The larva changes into a pupa in the following spring. The moths emerge late in June or early in July.

The insect was found commonly among the cranberry bogs of Cape Cod, Mass., and more sparingly among the bogs of New Jersey. I have also received specimens from central Texas.

This species agrees in some of its specimens absolutely so far as I can see with some specimens of *indigenella*. There are no points in markings or coloration which do not have their counterparts. Of course the species are distinct, in view of the larval history. But all through the Phycitidæ this difficulty is encountered, that species in all that is superficial intergrade, or are in the main counterparts. Often venation or other structure has to be studied to be certain to which species the insect examined belongs. In the case of *vaccinii* it seems to me the tuft at the summit of the basal member of the antennæ is always larger than it is in *indigenella*.

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5. **M. indigenella** Zell., Isis 1848, p. 651 (*Myelois*); Riley, Report Ins. Mo. iv, p. 41; Glover, Dept. Agric. 1867, p. 73; Packard, Guide 1869, 331; French, Ill. Rep. vii, 249, fig. 46, 1877; Riley, Can. Ento. xvi, 238, 1884; Grote, Can. Ento. xvii, 252, 1885; Weed, Ill. Rep. xv, 65, (Printed 1889); Saunders, Can. Ento. ii, 126, 1870; Ins. injurious to fruits, p. 93, 1883.

Nebulo Walsh, Proc. Bost. Soc. N. H. ix, p. 312, 1863 (*Phycita*); Proc. Ento. ii, p. 18, 1867.

Zelatella Hulst, Ento. Am. iii, 136, 1887 (*Myelois*).

Walsh's description is as follows:

"Expansion of wings ⅝ of an inch. (= 17—18 mm.) Length of body ⅓ of an inch. (= 7—8 mm.) Ground color light cinereous varied with dusky; a row of seven subsemilunar or linear dark spots on the outer margin of the wing; then one-fourth of the distance to the body, a waving light cinereous band, parallel to the exterior margin, marked on each side with dusky black. Nearly at the center a much abbreviated black band. Beyond the center on the costa a subtriangular dusky black spot, the apex of which connects with the apex of a much larger subobsolete triangular brick-red spot, which extends to the interior margin, and is bounded on the outside by a wavy, light cinereous band, which is again bounded by a wavy, dusky black band proceeding from the apex of the costal triangle. Base of the wing dusky black, inclosing a small, round, cinereous spot. Hind wings and all beneath light cinereous, shaded with dusky, the fore wings darker. Tarsi dusky, with a narrow, light, cinereous fascia at the apex of each joint. Hind tibia fasciate, with dusky at the apex, sometimes obscurely bifasciate. Middle tibia fasciate, with dusky at the centre, the fascia generally extending to the base, but becoming lighter. Anterior tibia dusky, with a narrow, apical, light cinereous fascia; palpi, both labial and maxillary, dusky."

LARVA.—This Riley describes as follows:

"Brown or greenish in color, cylindrical, tapering gradually from first to last joint. Head and cervical shield darker than the rest of the body, slightly shagreened, sparsely covered with long hairs, the shield quite large, convex and occupying the whole surface between stigmata, there being in front of the latter a subcervical, dark, horny plate. Joints 2 and 3 wrinkled, the former with two rather conspicuous dark dorsal piliferous spots. The other joints with a few fine hairs, the stigmata plainly visible, and the anal covering, but slightly horny. Legs and prolegs of moderate size, and of the same color as body."

PUPA mahogany-brown, with no striking character. Abdomen, especially above, with very minute punctures.

Weed gives the following summary of history, Illinois Rep. xv, 1885–86 (printed 1889):

"Recapitulating the facts brought out in various articles, the life-history of the 'leaf crumpler' may be briefly given as follows: The small, grayish moths appear in June or July, and deposit eggs on the various trees, which serve as food-plants for the larvæ. From these eggs soon hatch small brownish worms, which construct tubular silken cases, within which they remain concealed when not eating.

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As they grow larger they draw about the openings of their abodes many partially eaten leaves, so that by autumn there is quite a bunch about each case. At the approach of cold weather the cases are attached to the twigs by means of silken threads, the larvæ frequently gnawing away the bark to insure a firm hold; and thus the winter is passed. As soon in spring as the leaves begin to appear, the larvæ attack them, frequently eating out the flower buds as well. They continue feeding and gnawing until some time in June, when they become pupæ. About a fortnight later the moths emerge, and thus the life cycle is completed. The larvæ, it appears, feeds habitually upon the Apple, Quince, possibly the Peach, and on both the wild and cultivated varieties of the Cherry, Plum and Crab-apple. It has been found in New England, Canada, New York, Illinois, Iowa, Kansas and Texas, so that it probably covers the whole country east of the plains. It is very destructive to orchards in the Western States."

Var. **nebulella** Riley, Rep. Ins. Mo. iv, 41.

This differs in the more uniform and subdued tone of the fore-wings, the markings being more suffused and indistinct, but principally in the relative narrowness of the space outside the transverse posterior line, the greater consequent width of the middle field, and the smallness of the triangular brown spot, the space it occupies on the inner margin being scarcely one-half as wide as that between it and the transverse posterior line. The discal spots are also separated. Bred from Wild Crab (*Cratægus*).

I have specimens in which the brown triangle is obsolete. This name may stand for the variations which comparatively lack this spot, and as well all reddish color on the fore wings.

6. **M. juglandis** Le Baron, Ins. Ill. ii, 123, 1872 (*Phycita*); Riley, Ins. Mo. iv, 73, 1872; French, Ill. Rep. vii, 249, 1876; Packard, Ins. inj. shade trees, p. 82, 1881.

The description of *indigenella* Zell. will answer very well for this insect. The imaginal differences as they exist in some specimens Prof. Riley sums up as follows: "It is distinguished as follows: first, by the paler basal area of the front wings, which is sometimes almost white, especially near the costa, and by the head and shoulders and sometimes the antennal horn partaking of this paler color; secondly, by the darker median space, the dark triangular costal spot not being well relieved posteriorly, but extending so as sometimes to darken

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the whole space; thirdly, by the discal spots always being well separated."

There is no doubt that, if the larval history were not known, these two insects would be regarded as one species only, and not enough separated to be worthy a varietal name. But in view of the larval history there can be no doubt of their distinctness. I have found instances where the normal structure of the larval case was modified to suit circumstances, but never anything which approached so wide a departure of type as in these two insects, and then only as a temporary expedient.

Prof. Riley says of this insect: "the case of this insect is invariably straight, and the excrementitious grains which cover it on the outside are very closely and neatly woven together. It is attached by the small posterior end to the main leaf stalk, and the worm draws down and fastens two of the leaflets to hide it, and then feeds upon them from the point to the base. The worm differs in no respect from *nebulo*, except in being more commonly dark greenish. There is probably but one brood a year, and as with *nebulo* the larva passes the winter in a partially grown condition. As it lives in the summer on a compound leaf, it very wisely abandons this leaf and anchors its case firmly to the more enduring twig before winter sets in."

A difficulty has presented itself in connection with this insect which I have not been able, satisfactorily, to settle. The insect is ordinarily known as *juglandis* Le Baron. It was described by Le Baron in the 2d Report Illinois Insects. The same insect was described by Prof. Riley under the same name in the 4th Rept. Ins. Mo. Which description was first published I have as yet been unable to ascertain. The probabilities are that Prof. Riley's report first saw the light. It is a custom of courtesy to give a name to another author as his mss. name, but I do not think this possible under present zöological ideas. The first publisher of the name has priority, and the name stands as his. Were I certain of the dates of publication, and knew that of Prof. Riley's to antedate that of Le Baron, I would write the species *juglandis* Riley. But in view of the uncertainty, I follow the method of the past.

PIESMOPODA Zell.

(Type *rubicundella* Zell.)

Isis 1848. p. 606–863.

Labial palpi ascending, exceeding head, the end member rather long; maxillary palpi distinct, filiform; tongue strong; ocelli distinct; antennæ of ♂ thick, ob-

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liquely crenulate, pubescent, strongly notched near base; fore wings elongated, narrow; hind wings with transparent spots between the veins near base; thorax below with a tuft of hairs behind second segment. Venation: fore wings 11 veins, 4 and 5 stemmed, or appearing stemmed, 10 separate; hind wings 8 veins, 2 distant from angle, 3 separate, 4 and 5 stemmed, 8 long; cell very short, not more than one-fifth length of wing.

This is a summary of the characteristics of the genus as I learn from Zeller's description, with some added details from Mr. Ragonot, who has seen the type. Mr. Ragonot has seen the two species following and says they belong to *Piesmopoda*, but I place them here with grave doubt, and only because, unfortunately, I have now no ♂ to compare with the above diagnosis of the genus. Both species, however, are separated from the typical form in the ♀ by having in the hind wings 2 at the angle, and 8 very short. The two species also differ from each other. In *P. filiolella* 4 and 5 of the fore wings are long stemmed; in *P. subrufella* they are separate. Whether the type of the genus has ocelli I do not know. Zeller, in one place, says it does, in another says, with doubt, it does not.

1. **P. subrufella** Hulst, Ento. Am. iii, 132. 1887 (*Nephopteryx*).—Expands 12—14 mm. Head and thorax purple fuscous. Abdomen ochre fuscous, with purple tinge on dorsum. Fore wings ochre fuscous. Basal line black, or purple black, sometimes obsolete. Middle and outer fields reddish fuscous, generally with a purple stain, except along costa, which over middle space is marked with a grayish stripe. Outer line faint, edged on each side with purple reddish. A small, black, discal point. Hind wings light fuscous. Beneath light ocher fuscous.

Florida, April.

2. **P. filiolella** Hulst, Ento. Am. iv, 117, 1888 (*Nephopteryx*).—Expands 16—18 mm. Palpi reddish brown; head and thorax brown; abdomen brown, with an ochreous shading. Fore wings brown, ocherish gray along costa, chestnut-red on posterior median space and outer margin; basal line blackish, indistinct; outer line dark gray, broad, indistinct, edged on both sides with blackish. Hind wings fuscous, outer margin and veins much darker.

Texas, April.

PHYCITOPSIS Rag.

(Type *flavicornella* Rag.)

Diag. N. A. Phyc. p. 4, 1887.

Of this genus Mr. Ragonot says: "Very close to *Phycita*, of similar neuration and shape, but antennæ strongly crenate pubescent, not curved near base and without any tuft of scales." The description of *Phycita* apart from the characters mentioned is as follows:

Labial palpi erect, recurved; second member twice third; maxillary palpi present, distinct; tongue strong; ocelli present; legs, all tarsi spinulated; fore

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tibia shorter than tarsus. *Phycita spissicella* is tufted on thorax below on each side. Venation: fore wings 11 veins, 4 and 5 separate, 10 separate; hind wings 8 veins, 2 near angle, 3 separate, 4 and 5 stemmed, 6 short stemmed with 7; cell short, about one-third of wing.

1. **P. flavicornella** Rag., Diag. N. A. Phyc. p. 4, 1887 (*Phycitopsis*).—Expands 26 mm. Fore wings elongate, nearly straight on costa, gray, marked with reddish brown and suffused with blackish toward the costa; lines approximate, gray, indistinctly edged with brownish black, a triangular patch of brownish red and black scales before first line. Discal spots invisible. Antennæ pale yellow, head in front dark. Very much like *Phycita spissicella* Fab. in appearance.

Texas.

DIORYCTRIA Zell.

(Type *abietella* S. V.)

Isis, 1846, p. 732; Isis, 1848, p. 585; Von Heinemann, Pyr. p. 148, 1865; Ragonot, Ento. Mon. Mag. xxii, p. 52, 1885.

Labial palpi erect, exceeding front; maxillary palpi distinct, filiform; tongue strong, ocelli present; antennæ of ♂ pubescent, slightly bent above base with a ridge of appressed tufts of scales in bend. Venation: fore wings 11 veins, 4 and 5 separate, 10 separate; hind wings 8 veins, 2 quite far from angle, 4 and 5 stemmed, 6 and 7 stemmed.

Synopsis of Species.

Fore wings bright orange-yellow.....**auranticella.**
" fuscous gray.....**abietella.**
" ferruginous.....**clarioralis.**
" more or less red.....**actualis.**

1. **D. auranticella** Grote, Ann. Mag. Nat. Hist. 1883, p. 57 (*Nephopteryx*). Trans. Kans. Acad. Sci. viii, 57, 1883; Hulst. Ento. Am. v, 156, 1889; *miniatella* Rag. Diag. N. A. Phyc. p. 4, 1887 (*Dioryctria*).—Expands 30 mm. "Fore wings bright orange-red. A white, somewhat diffuse longitudinal stripe from base to end of median vein, followed by a slight oblique white clouding; subterminal line white, contrasting with the red wing, running inwards a little on costal and internal margins. The wing is more yellowish or orange at base, redder outwardly. Tegulæ and sides of collar orange. Head above and collar centrally white. Legs red outwardly; palpi red, white at base. Thorax beneath, white. Hind wings pale translucent fuscous, with a fine terminal line and white fringes interlined at base. Beneath yellowish fuscous, with a red mark on the primaries at costal inception of transverse line. This brilliant species wants the usual transverse line on wings above."

Arizona, New Mexico, Colorado.

I have received a specimen of his *miniatella* from Mr. Ragonot, and it is the same as Mr. Grote's species. The insect is one of the most beautiful of all our *Phycitidæ*, and is as well very strongly marked.

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2. **D. abietella** S. V. p. 138. 1776 (*Tinea*); Fabricius, Ento. Sys. iii, 2, 302, 1793; Mant., ii, 245, 1787; Illiger, ii, B, p. 102, N. 16, 1801; Bechstein, iii, 800, 1805; Zincken Germ. Mag. iii, 160, 1818 (*Phycis*); Treits., Schm. Eur. ix, 1, 177; Dup., Hist. Nat. x, 281, 4; Charpentier, Schm. Wien. p. 133, 1821; Lienig, Lievl. Fal. p. 119; Ratz., Forst. Ins. xv, fig. 2, 1840; Eversmann, Fauna Lep. p. 561, 1844; Steph., Brit. Ent. iv, 309, 1834 (*Phycita*); Wood, Index Meth. fig. 1, 472; West. and Hump. Brit. Moths, p. 232, pl. 115, fig. 26, 1839; Zeller, Isis, 1846, p. 176 (*Dioryctria*); Herrich Schaeffer, Sys. Bear. iv. p. 79, 1849; Wall., Pyr. p. 1033, 1859; Bonwst, iii, p. 202, N. 40; Stainton, Manual ii, 175, 1859; Morris, Brit. Moths, pl. 80, fig. 12, 1872; Snellen, Vlin. Neth. Micr. i, p. 133; De Geer, Ins. ii, p. 360-362, 439, pl. 9, figs. 10, 13, 14; Frey, Lep. Schw. p. 573, 1880; Schneid., Ins. Norw., iii, 125.

decuriella Hüb., Samml. p. 35, 17, pl. 11, 74; Verz,, p. 370; Rag., Ento. Mon. Mag. xxii, 52, 1885.

reniculella Grt., N. A. Ento. i, 67, 1880 (*Pinipestis*).

abietivorella Grt., Bull. U. S. Geol. Surv. iv, 701, 1878 (*Pinipestis*).

Labial palpi, head, thorax and fore wings light gray, washed somewhat with fuscous and heavily sprinkled with blackish scales, giving to all a blackish gray appearance; basal field with two black spots along inner margin; middle field more heavily blackened over inner half, becoming often a blackish band; outer field lightest along outer margin, on which the blackish veins show distinctly; lines generally very distinct, white, lined on both sides with black; the basal narrow, twice dentate, somewhat oblique; the outer also dentate below costa and near inner margin, and more finely between these two. Discal spot a white lunule. Hind wings light pellucid fuscous, darker on veins and outwardly.

The larva bores into and feeds upon Pines. It does not seem to be very common in America, though it is said sometimes to cause great destruction to Pine forests in Europe. I have seen no description of the larva, but it probably resembles very closely in appearance and habits that of *P. Zimmermanni* Grt. Dr. Frey (Lep. Sch. p. 273) says it lives in the pitch of Pine trees, and Siebke, in "Schneider's Insects of Norway," says the adult larva hibernates under mosses. The insect flies in June and July, and has been taken generally in the Eastern States as well as in Texas and Colorado.

3. **D. actualis** Hulst. Trans. Am. Ento. Soc. xiii. 161, 1886 (*Nephopteryx*).—Expands 26 mm. Palpi, head and thorax black, with intermingled white scales giving a dark gray aspect. Abdomen grayish fuscous; fore wings cinereous fuscous, basal space in middle reddish; first line white, edged outwardly with black, which is pronounced at costa; this line is angulated twice and begins on costa as far from base as on inner margin; middle space cinereous fuscous outwardly; outer line white, angulated; outer space with reddish, except at costa and posteriorly; a marginal line of well-marked black dots and a black discal spot on middle field; hind wings dark fuscous; margin black; all fringes light fuscous, black at base; beneath, quite even fuscous, a faint outer lighter line on fore wings.

Colorado.

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I have been perplexed in determining the position of this insect. The antennæ are very nearly intermediate between *Dioryctria* and *Nephopteryx;* I have finally concluded it favors *Dioryctria* the more, and so have located it.

4. **D. clarioralis** Walker, C. B. M. pt. 27, p. 54, 1863 (*Nephopteryx*).--Cinereous, head and fore part of the thorax blackish cinereous. Fore wings rather narrow, somewhat rounded at the tips, slightly black speckled, here and there ferruginous, with two pale cinereous irregularly undulating black bordered lines. Space on the inner side of the first and discal space between the two lines more or less clouded with black; marginal points black; costa straight, exterior border slightly convex, hardly oblique. Hind wings brownish cinereous; fringe pale, cinereous, interlined. Expands about 28 mm.

United States.

This is Walker's description; the reference is Mr. Ragonot's. I do not know the insect.

PINIPESTIS Grote.

(Type *Zimmermanni* Grt.)

Can. Ento. x, 19, 1878; Bull. U. S. Geol. Surv. Terr. iv, 699, 1878.

In every respect like *Dioryctria*, except that there is upon the fore wing a raised scale ridge or tufting just within basal line.

Synopsis of Species.

1. Color nearly all reddish.....**pygmæella.**
   " mostly blackish.....2.
2. Cross lines pure white, very distant, basal straight.....**amatella.**
   " dull white, quite near, basal oblique.....**Zimmermanni.**
   " white, approximate, basal dentate.....**albovittella** n. sp.

1. **P. pygmæella** Rag., Diag. N. A. Phyc. p. 5, 1887 (*Dioryctria*).--Expands 17 mm. Fore wings purplish gray with irregular patches of dark red; lines pale gray, sinuous, with black margins, which broaden out into patches on the costa; scale ridge dark; an oblique lunule on disc. Hind wings fuscous.

North Carolina, Florida.

2. **P. amatella** Hulst, Ento. Am. iii, 131, 1887 (*Nephopteryx*).--Expands 27 mm. Head light gray; palpi fuscous; color light gray. Thorax fuscous in front, gray behind. Abdomen gray, with the segments banded with fuscous anteriorly, and a black spot on dorsum. Fore wings brown with some reddish posteriorly, three white cross lines; the first extra basal, diffuse, broad, edged outwardly with black; the second central, twice angulate inwardly, lined outwardly with black, which is followed centrally by a whitish blotch; the third submarginal with large sinus inwardly below costa, and a dentation before middle, then curved to inner margin; it is lined inwardly with black, which is preceded by a diffuse lengthened whitish blotch, confluent with the rather large white discal spot. Margin a black line, preceded by a gray band. Hind wings fuscous, with black marginal line. Beneath dark fuscous, with lighter fuscous outer line, less distinct on hind wings.

Florida.

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3. **P. Zimmermanni** Grt., Can. Ento. ix, 161, 1877 (*Nephopteryx*); x, 19, 1878; Bull. U. S. Geol. Surv. Terr. iv, 699, 1878 (*Pinipestis*); v, 589, 1879; Packard, Ins. Inj. Shade Trees, p. 182; Grote, N. Am. Ento. I, 11, pl. 2, fig. 10, 1879; Zimmermann, Can. Ento. x, 20, 1878; Kellicott, Can. Ento, xi, 114; xii, 59.—Expands 28—32 mm. Fore wings blackish gray, shaded with reddish on the basal and terminal fields; the lines are prominent, consisting of double black lines enclosing pale bands; the inner line is perpendicular, bidentate; the outer line is once more strongly indented below costa; the black shadings of pale lines equally distinct on both sides; the median field is blackish, becoming pale toward the outer line; it shows a pale sometimes whitish cellular spot, surmounted with raised scales. It can be seen that these raised scales (easily lost in setting the insect), accompany the median lines as well as form the discal mark and the basal line; the terminal edge of the wing is pale or ruddy before the terminal black line; the fringes are blackish. The hind wings are pale yellowish white, shaded with fuscous on costal region, and more or less terminally before the blackish terminal black line; the fringes are dusky. Beneath the fore wings are blackish, marked with pale on costa; hind wings as on upper surface.

Mr. Grote says, also, Can. Ento. ix, 161: "in the months of June and July, the Red Pine (*Pinus resinosa*) and the White Pine (*Pinus strobus*), show by the exuding pitch that they are suffering from the attacks of an insect. The wounds occur on the main stem below the insertion of the branch. On cutting into the bark the injury is found to be caused by a small larva, which, when full grown, measures 16–18 mm. The head is shining chestnut-brown with black mandibles. The body is livid or blackish green, naked, with series of black dots, each dot giving rise to a single, rather stout bristle. The prothoracic shield is blackish. The larva has sixteen legs. This larva, eating on the inner side of the bark and making furrows in the wood, causes the bleeding, which, when depletion is excessive or continuous, and, especially in the case of young trees, has proved fatal.

"In July the worm spins a whitish, thin, papery cocoon in the mass of exuding pitch, which seems to act as a protection to both larva and the chrysalis. The chrysalis is cylindrical, smooth, narrow, blackish brown, about 16 mm. in length. The head is pointed, there being a pronounced clypeal protuberance; the segments are unarmed; the anal plate is provided with a row of four spines and two others more slender on either side of the mesial line below the first. The imago appears in ten to fourteen days."

Mr. Grote also says, Bull. U. S. Geol. Surv. Terr. iv, 700, 1878: "It is not certain how the hibernation of *P. zimmermanni* is accomplished. From the fact that Mr. Zimmermann has found larvæ resembling those of this species in the clots formed by the exuding

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pitch in January, it may be that the species winters in the larval state, and that it is single brooded. The identification of these winter larvæ is not complete. In color they are more pinkish than the specimens taken in June. Again, whether the larvæ feed on the gum or not is uncertain, though certain of the facts observed point to this conclusion.'' The insect is found in New York and Pennsylvania, and Mr. Grote says he has known it to be in such abundance that young Pine trees were killed by it.

Mr. Zimmermann (Can. Ento. x, 20, 1878), says: "There is scarcely a Pine more than four feet high on our grounds that is not more or less affected by this borer.'' Further on he says: "*Pinus sylvestris* seems to suffer most, as the limbs, and often the main stem, are constantly breaking off.''

Mr. Kellicott says (Can. Ent. xi, 115): "April 12th I took many larva of various sizes, .25—.70 of an inch (6–18 mm.) in length when crawling, so there is no longer any doubt as to the winter stage. None of those taken were 'livid, or blackish green,' but dull white; nor do the hairs arise from a 'series of black dots,' but from light brown ones. I take it to be a case where a naked hibernating larva is lighter than during the warm summer.''

4. **P. albovittella** n. sp.—Expands 25 mm. Labial palpi and head fuscous gray; thorax gray; abdomen light gray; antennæ fuscous, tuft black; fore wings light gray, overlaid more or less thickly with a powdering of black; basal field rather long; at the middle a raised ridge of black scales; basal line white, bidentate, lined with black on the outside; discal spot white, rather large, oval, consisting of large raised scales; outer line bidentate, wavy, lined with black within, extreme costa blackish; a faint shade of reddish basally. Hind wings transparent light fuscous, darker on veins.

Hot Springs, N. Mex., August. This insect has considerably the appearance of the lighter specimens of *Salebria contatella* Grote.

DASYPYGA Rag.

(Type *alternosquamella* Rag.)

Diag. N. A. Phyc. p. 5.

Labial palpi ascending, maxillary palpi filiform; antennæ simple, pubescent; fore wings rather short, costa nearly straight, hind margin sinuous. Venation: fore wings 11 veins, 4 and 5 separate but close, 10 separate; hind wings, 2 near angle, 4 and 5 stemmed, 3 close appearing stemmed with these, 8 separate from 7. Fore wings with basal scale ridge.

1. **D. alternosquamella** Rag., Diag. N. A. Phyc. p. 5, 1887 (*Dasypyga*). —Expands 20 mm. Fore wings reddish ochreous, with a rosy hue, base to nearly the middle of the wing suffused with grayish black. First line straight, oblique, brown, edged with blackish internally, and externally with a line of dark red-

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dish brown raised scales; second line very approximate to hind margin, sinuous, lined with dark brown. A whitish streak on median vein and a dark brown streak on each fold; ciliæ blackish.

California.

Variety **stictophorella** Rag., Diag. N. A. Phyc. p. 5, 1887.

This has the streak on the median vein pure white and the lower discal spot is distinctly marked in it.

TACOMA* Hulst.
(Type *feriella* Hulst)

Ento. Am. iv, 115, 1888.

Labial palpi erect, rather short; maxillary palpi distinct, filiform; tongue strong; ocelli present; antennæ of ♂ bent above base, a very large tuft of scales in bend. Genitalia of ♂: uncus short, broad at base; harpæ bilobed, without clasper spine; lower plate spatulate, armed with inturned hairs; within, in passage, one short stout, and one long slender spine. Venation: fore wings 11 veins, 4 and 5 stemmed, 10 separate; hind wings 2 near angle, 3, 4 and 5 stemmed; 6, 7 and 8 stemmed; cell very short, about one-fourth wing.

Abdomen of ♀ with ten or twelve short spines on the penultimate and antepenultimate segments beneath.

1. **T. feriella** Hulst, Ento. Am. iv, 115, 1888.—Expands 20 mm. Palpi gray, white beneath; head and thorax dark gray with a bluish shade; abdomen fuscous gray, interlined with light gray; fore wings dark gray with a bluish shade; lines whitish, the inner nearly at middle, angulate, the outer waved and dentate, subparallel with outer margin; on inner margin just beyond basal line is a rather large broken white spot; discal spot faint, with outer edge whitish; a marginal line of black points; hind wings fuscous, a black marginal line.

Texas.

PROMYLEA Rag.
(Type *lunigerella* Rag.)

Diag. N. A. Phyc. p. 5, 1887.

Near *Brephia* Hein. Antennæ thick, pubescent, simple. Palpi thin, ascending, recurved; maxillary palpi filiform. Fore wings 11 veins, 4 and 5 close, but separate, 10 separate. Hind wings 8 veins, 2 from just before the angle of the cell, 3 and 5 appearing shortly stemmed, 8 distinctly stemmed with 7.

I have not been able to study, though I have seen the single species under this genus.

1. **P. lunigerella** Rag., Diag. N. A. Phyc. p. 5, 1887.—Expands 22 mm. Fore wings light reddish brown, with a rosy tint, grayish in median area, cross lines grayish; first line oblique, slightly sinuous, externally edged with a black line and preceded by a broadish red-brown band, which is internally edged by straight black line; second line sinuous, bulging out in the middle, and lined with black on both sides; a brown lunule on disc.

Vancouver's Island.

* An Indian tribe of Washington.

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GLYPTOCERA Rag.

(Type *consobrinella* Zell.)

Cat. N. A. Phyc. Ento. Am. v, 114, 1889.

Labial palpi short, erect, recurved, middle member heavily scaled, four times end member: maxillary palpi distinct, small; tongue middling strong; antennæ pubescent, bent above base, toothed in bend, with scales appressed, tufted, but much like *Dioryctria:* ocelli distinct. Venation: fore wings 11 veins, 4 and 5 short stemmed, or from a point, 10 separate. Hind wings 8 veins, 2 near angle, 3 stemmed or separate, 4 and 5 stemmed, 8 stemmed with 7. Genitalia not studied.

This description is from the type in the Cambridge Museum. I am not aware that Mr. Ragonot has described the genus.

1. **G. consobrinella** Zell., Verh. Zool.-Bot. Ges. Wien, 1872, p. 548 (Beit. I, 102) (*Nephopteryx*).—Expands 22—30 mm. Labial palpi dark fuscous, front light gray; antennæ dark fuscous; thorax fuscous; abdomen dark fuscous, annulated with ocher yellow; fore wings gray, washed over with fuscous, except at base and on outer field; base reddish, not so decided costally, often obsolete altogether, and never reaching basal line; basal line oblique, sinuate, with a broad blackish inner band; middle field darker on basal half with a little washing of reddish; discal spots quite distinct; a short black dash just beyond lower spot, and another black dash at middle near inner margin; outer line gray, finely sinuate, rounded at middle, angulate above and below, edged on both sides finely with black, as is also the basal line outwardly; marginal line black; the basal line is distant from base and the two lines approximate on inner margin. Hind wings yellow light fuscous.

Texas, Florida.

ORTHOLEPIS Rag.

(Type *jugosella* Rag.)

Diag. N. A. Phyc. p. 6, 1887.

Labial palpi thick, broad, brush-like in front, oblique; maxillary palpi fan-like; head with a strong tuft of scales in front; antennæ hardly pubescent, curved and thickened towards base, with a furrow filled with black scales in the curve. Fore wings with a basal scale ridge. Venation: fore wings 11 veins, 4 and 5 nearly parallel. Hind wings 8 veins, 4 and 5 stemmed, 3 appearing stemmed with them, 8 separate.

1. **O. jugosella** Rag., Diag, N. A. Phyc. p. 6, 1887.—Expands 20 mm. Fore wings narrow at base, costa arched, gray, suffused posteriorly from middle of median area and in basal area with blackish tinted with purplish; cross lines gray, the first oblique, edged externally with black on the costa and preceded on the inner margin by a straight thick ridge of black scales; second line sinuous; discal spots distinct.

No locality given.

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AMBESA Grote.
(Type *lætella* Grote)

N. A. Ento. i, 98, 1880; *Pristophora* Rag., Annales Soc. Ento. France, 1887, p. 229.

Labial palpi erect, somewhat recurved, squamose; maxillary palpi small; tongue strong; ocelli present; antennæ pubescent, bent above base, without tuft, but the members prolonged into teeth. Genitalia of ♂: uncus rounded, conical with short spine at top; harpe narrow, but little more than a strong long arm covered with long hairs; lower plate quadrate, conical at end, broad, suddenly widening below; the whole resting on a strong framework capable of extension; last segment of abdomen beneath with shield and two strong tufts of hairs. Venation: fore wings 11 veins, 4 and 5 separate, 10 separate; hind wings 8 veins, 2 quite distant from angle, 3 separate, 4 and 5 stemmed.

Synopsis of Species.

1. Color reddish purple and whitish ..... **lætella.**
   otherwise ..... 2.
2. Basal line broad black; color white ..... **niveella.**
   " narrow; color not white ..... 3.
3. Fore wings triangular, outer line even ..... **Walsinghamiella.**
   " rounded, subparallel; outer line dentate ..... **lallatalis.**

1. **A. lætella** Grote, N. A. Ento. i, 98, 1880.—Expands 20—28 mm. Bright brown and whitish gray, brightly colored and distinctly marked; a brown patch shading to blackish inferiorly on costa, edged inwardly by the black anterior line, and outwardly by the narrow discal spot, margined straightly in the cell against a white shade, which comes from the basal field; anterior line preceded by brown shade and white line; median space with a brown shade on inner margin wide, the lines far apart; outer line blackish, followed by a white line and succeeded by a diffuse brown shading, which forms a defined blackish brown spot before the apices on costa. A fine black terminal line; fringes fuscous, with a hair line at base. Hind wings translucent, with paler interlined fringes. Beneath fore wings fuscous; hind wings paler; discontinued exterior lines indicated. Head and thorax gray.

Colorado. A beautiful species.

2. **A. niveella** Hulst, Ento. Am. iv, 117, 1888 (*Lipographis*).—Expands 29 mm. Palpi, head and thorax pure snowy-white, with a slight sprinkling of black scales; abdomen yellowish white; fore wings pure snowy-white, more or less marked with black; costa white; posteriorly the wing is finely marked with black on veins, and on posterior half stained with fuscous; basal line narrow, white, shaded inwardly along inner margin with large black spot; outwardly with narrow line of black; outer line white, toothed within between the veins, edged with a line of black points outwardly along margin; apex with two black points on either side the outer line; hind wings dirty whitish, yellowish at apex and along anterior margin.

Colorado.

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3. **A. lallatalis** Hulst, Trans. Am. Ento. Soc. xiii, 161, 1885 (*Nephopteryx*).
denticulella Rag., Diag. N. A. Phyc. p. 6, 1887 (*Pristophora*).

Expands 30—34 mm. Palpi cinereous, black at base of second labial segment and at tip. Head and thorax cinereous. Abdomen nearly white, a little fuscous anteriorly on each segment: the whole of these peppered with black scales; fore wings cinereous, being white with a liberal peppering of black scales, most decided centrally and posteriorly; lines hardly to be traced; the first one showing in a white crescent, concave outwardly along inner margin and located on costa by black point outwardly; discal spot black, minute; outer line evident in an apical white crescent, concave outwardly, inclosing fuscous space; apex white; marginal line black; fringe gray: hind wings translucent light fuscous: fringe a shade lighter; beneath fuscous; the hind wings lighter; a black diffuse spot at apex of fore wings indicating the outer cross line.

Colorado.

4. **A. Walsinghami** Rag., Diag N. A. Phyc. p. 6, 1887 (*Pristophora*).—Expands 26 mm. Fore wings gray, strongly washed with purplish black in basal area, and obliquely in median area; costa ashy gray to second line. Lines white, narrow, distinct; the first edged internally with blackish, bends suddenly backwards along the edges of the cell to the middle of the median area, forming afterwards an acute angle on the dorsal fold, second line sinuous, rounded in the middle.

California.

NEPHOPTERYX Hüb.

(Type *rhenella* Zinck.)

Verz. p. 370, 1816; Zeller, Isis 1846, p. 731, 732; 1848, p. 585; Herrich-Schaeffer, Sys. Bear. iv, p. 78, 1849; Von Heinemann, Pyr. p. 149, 1865; Grote, Bull. U. S. Geol. Surv. Terr. iv, 695, 1878; N. A. Ento. i, 11, 1879; Meyrick, Proc. Linn. Soc. N. S. Wales iii, 201, 1878; Ragonot, Ento. Mon. Mag. xxii, 19, 1885.

Sciota Hulst, Ento. Am. iv, 115, 1888.

Labial palpi erect, recurved, end member short, about one-fifth second member; maxillary palpi distinct, filiform; tongue long and strong; ocelli present; antennæ of ♂ bent above base, with heavy scale tuft in bend; legs, all tarsi spinulated, spurs long, fore tibia = upper tarsus; abdomen with end segment having four tufts on each side below. Genitalia of ♂: uncus broad, spine short; harpe narrow, without clasper; lower plate spatulate conical, passage within with two heavy spines. Venation: fore wings 11 veins, 4 and 5 very short stemmed or separate, 10 stemmed or separate; hind wings 8 veins, 2 near angle, 3 separate though close, 4 and 5 short stemmed or separate, 6 stemmed with 7, 7 stemmed with 8 or separate; cell short, about one-third wing.

Synopsis of Species.

1. Fore wings more or less reddish ochreous.....2.
" gray.....8.
2. " entirely suffused with reddish.....**inquilinella.**
3. Middle and outer fields nearly even unicolorous.....4.
" " not even unicolorous.....5.

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4. Basal field all reddish.....**basilaris.**
" light ocher gray.....**gilvibasella** n. sp.
5. " all reddish ochreous.....6.
" not so.....7.
6. hind wings light; middle field gray.....**subtinctella.**
" dark fuscous; middle field ocher reddish....**rubrisparsella.**
7. Red band before basal line and after outer line; discal spots distinct. **ovalis.**
Washed with red along inner margin; no discal spots.....**pergratialis.**
A quadrate reddish spot along costa beyond basal line.....**furfurella.**
8. Costa lighter than the unicolorous rest of the wing.....**scobiella.**
" not lighter.....9.
9. Lines generally indistinct; fore wings nearly unicolorous gray. **rhypodella.**
" distinct.....10.
10. Fore wings even brown.....**hypochalciella.**
" not " .....11.
11. Outer line deep angled at 2 and 6: basal shading narrow. .....**fasciolalis.**
" slightly sinuous; basal shading heavy black..**crassifasciella.**

1. **N. pergratialis** Hulst, Trans. Am. Ento. Soc. xiii, 162, 1886.
grotella Rag., Diag. N. A. Phyc. p. 6, 1887.

Expands 28 mm. Palpi, head and antennæ dark brown; thorax brown, with a maroon shading. Abdomen fuscous; fore wings cinereous over anterior portion, becoming reddish fuscous on posterior portion; the inner line indistinct, but its outer shading of black prominent; outer line near margin finely dentate, edged on both sides with black, especially to be noticed near apex: a subterminal cinereous dentate line and a marginal row of black spots; fringe fuscous, scales white at ends; hind wings dark fuscous; beneath fore wings dark fuscous, hind wings fuscous.

Florida.

2. **N. scobiella** Grt., N. A. Ento. i, 51, 1880.
decimerella Hulst, Ento. Am. iv, 117, 1888 (*Lipographis*).

Expands 26 mm. Palpi, collar and thorax gray, stained with fuscous; head somewhat whiter; abdomen light ochreous gray, almost yellowish at middle; fore wings lead-gray, broadly whitish along costa nearly to apex, whitish with a reddish shade along inner margin; fringes whitish, hind wings dark fuscous, fringes lighter. There is considerable variation in the different specimens, some having generally a reddish tone, others being more inclined to clear gray.

Texas, New Mexico.

3. **N. furfurella** Hulst, Ento. Am. iii, 131, 1887.—Expands 22 mm. Head, thorax and fore wings smoky blue-gray. Abdomen yellowish fuscous; fore wings with a black spot along inner margin, one-third from base, with a subobsolete russet band, extending from this towards costa, but not reaching beyond middle, when apparent. Hind wings fuscous, lighter basally. Beneath fuscous, darkest along costa of fore wings.

Florida, Texas.

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4. **N. ovalis** Packard, Ann. N. Y. Lyc. N. Hist. x, 269, 1873 (*Pempelia*); Grote, Bull. U. S. Geol. Surv. Terr. iv, 696, 1878; N. A. Ento. i, 11, pl. ii, fig. 9.
♀ *latifasciella* Pack., Ann. N. Y. Lyc. N. Hist. x, 269, 1873.

Expands 20—25 mm. Body and fore wings ash, being covered with whitish and brown scales; fore wings with a short, curved, dark line at base of median vein. On inner third of wing a broad brown band, directed obliquely outward from the costa to the inner edge, including a large, distinct, regularly oval (longitudinal), ochreous spot between the median and submedian veins; two obscure, black, discal points, situated as usual; the outer one is enclosed in a dusky shade crossing the wing obliquely and limited beyond by the usual submarginal zigzag line; this line is curved inward below the costa; from the middle of the wing to the inner margin, it is exactly parallel to the outer edge, terminating in an angle directed outwards. Between this line and the edge is a series of dusky bars, the interspaces cinereous. A marginal black line; fringe cinereous. Hind wings pale smoky. Beneath the fore wings dusky, a whitish costal spot near the apex, but no line; hind wings slightly paler. Legs dull ash, ringed with whitish.

Maine, New York, Canada, California, Washington, Texas.

Var. **geminipunctella** Rag., Diag. N. A. Phyc. p. 7. 1887.—Expands 24 mm. This variety is white, slightly suffused with grayish, the cross lines white, the first preceded by a distinct brown orange band marked with black on the veins. Discal and marginal spots distinct.

California.

Var. **hypochalciella** Rag., Diag. N. A. Phyc. p. 7, 1887.—Expands 25 mm. Fore wings unicolorous dark brown, sparingly dusted with whitish, lines whitish, the band before first line, and its white internal edging invisible; hind wings and fringes very dark brown.

Washington.

5. **N. rhypodella** Hulst, Ento. Am. iii, 137, October, 1887 (*Glyptoteles*).
curvatella Rag., Diag. N. A. Phyc. p. 7, December, 1887.

Expands 24—26 mm. Labial palpi fuscous gray, sprinkled with black; antennæ fuscous; head and thorax fuscous gray; abdomen lighter ocher fuscous; fore wings quite even unicolorous gray, lines generally indistinct, basal oblique, waved, or dentate; outer heavily dentate beyond anterior angle of cell, then rounded outwardly, again bent inwards; inner margin much further than usual, then turning to costa forming a deep angle; a blackish spot at middle of middle field. Hind wings yellowish fuscous.

Illinois.

I sent a type to Mr. Ragonot, which he returned labeled *Neph. curvatella*. Mr. Ragonot described it as a variety of *ovalis* Pack. He has since in a letter expressed his belief it might be a good species. For myself I see no resemblance whatever to *ovalis* in the insect.

6. **N. fasciolalis** Hulst, Trans. Am. Ento. Soc. xiii, 162, 1886 (*Pinipestis*).—Expands 29 mm. With very much the aspect of *Ambesa lallatalis*, but with lines

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rather broad and decided, and curvatures in opposite direction; both lines shaded on both sides with black; a blackish cloud in median space ending in black discal spot; hind wings fuscous; beneath fuscous; the fore wings darker with white spot near apex, showing beginning of outer line.

Nevada, British Columbia.

The general appearance is very decidedly like an enlarged squamose specimen of *Dioryctria abietello*.

7. **N. rubrisparsella** Rag., Diag. N. A. Phyc. p. 6, 1887 (*Pristophora*).
rufibasella Rag., N. A. Phyc. p. 7, 1887.
croceella Hulst, Ento. Am. iv, 115, 1888 (*Sciota*).

Expands 17—19 mm. Fore wings dirty yellowish ochreous, dusted with brick-red, especially towards the inner margin and base; cross lines pale, the first black, margined on both sides, nearly straight: the second sinuous, dentate, edged internally with black. Discal spots distinct. Thorax reddish, antennæ yellowish, in the curve black on each produced joint. Hind wings semi-transparent, pale grayish ochreous.

Texas.

8. **N. gilvibasella** n. sp.—Expands 18—20 mm. Labial palpi light ochreous gray; antennæ yellowish fuscous; head light ocher fuscous; thorax rather darker; abdomen yellowish fuscous, somewhat annulated with fuscous; fore wings short, broad, arched on costa, subtriangular, angles distinct, color light gray, washed over with fuscous, giving a general even fuscous appearance; base to basal line light ocher gray; lines very indistinct, the first noticeable only by the darker outer shading, which is broad at costa, narrowing and becoming obsolete before reaching inner margin; outer line gray, faint, rounded at middle, slightly dentate near outer margin; not heavily shaded with dark fuscous within; a single discal spot, faint. Hind wings yellowish fuscous, darker on margin, the wings somewhat falcate.

Central Texas.

9. **N. basilaris** Zell., Verh. zool.-bot. Ges. Wien 1872, p. 548 (Beit. i, 103), pl. iii, fig. 23; Grote, N. A. Ento. i, 51, 1880.

Labial palpi fuscous below, whitish at end; front whitish; antennæ fuscous gray, tuft white; summit of head, thorax and base of wings, reddish ocherous, the inner margin of base somewhat blackened, basal line distinct, gray, rounded in middle, dentate near inner margin, edged both sides with deep black; middle and outer fields nearly unicolorous gray; outer line faint, gray, showing sharp dentations. Hind wings yellowish fuscous, darker on veins and on outer margin.

Massachusetts, Texas, Colorado.

10. **N. inquilinella** Rag., Diag. N. A. Phyc. p. 88, 1887.—Expands 18—24 mm. Fore wings gray, posteriorly suffused with red, blackish on costa, cross lines gray, ill-defined, the first slightly elbowed on median vein, indistinctly black margined, preceded by a broad, straight, red band; second line sinuous, much clouded with reddish; discal spots distinct. In galls of *E. salicis-nodum*.

Wisconsin.

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I identified this as *Neph. carneella* Hulst, Ento. Am. v, p. 156. I find on an examination of new material that I placed two species under my name, part being *Nephopteryx*, part *Salebria*. I therefore attach my own name to the species of *Salebria*, thus allowing Mr. Ragonot's name to remain. The species very closely resemble each other, but I have seen no males of *inquilinella*.

11. **N. crassifasciella** Rag., Diag. N. A. Phyc. p. 8, 1887.—Expands 16 mm. Fore wings dark gray, lines dark gray, distinctly black margined on both sides; the first oblique, its anterior edging very broad, nearly perpendicular; second line slightly sinuous. Discal spots distinct.

No locality given, and I have never seen the insect.

12. **N. subtinctella** Rag., Diag. N. A. Phyc. p. 7, 1887.--Expands 24--25 mm. Fore wings very narrow, elongate, gray, suffused with reddish brown, the costa washed with blackish; basal area simply gray, a large brick-red patch or band before the first line. Lines gray, rather approximate, the first perpendicular, thrice angulated; second line sinuous, a black lunule on disc.

California.

I have never seen this insect.

TLASCALA* n. gen.
(Type *reductella* Wlk.)

Like *Nephopteryx*, differing only in that there is a basal scale ridge on fore wings above; the venation is as follows in type: fore wings 11 veins, 4 and 5 short stemmed, 10 separate; hind wings 8 veins, 2 at angle, 3 separate, but close to stem of 4 and 5, 4 and 5 long stemmed, 8 separate from 7, but close, 6 separate from 7.

1. **T. reductella** Walk., C. B. M. pt. 27, p. 62, 1863 (*Nephopteryx*), Rag., Cat. N. A. Phyc. Ento. Am. v, 115, 1888.

gleditschiella Fernald, Dept. Agr. Rep. 1880, p. 262 (*Pempelia*).

Expands 19--22 mm. Head, palpi, antennæ, thorax above and beneath, legs and fore wings light ashy-gray. Most of the examples have a purplish tint on all these parts, deepest on the thorax above and basal portion of fore wings. A black dash broken in middle crosses the thorax, behind the middle, starting from under the patagiæ on either side. Fore wing with a broad black band crossing it at the basal third, which consists of three or more lines of raised black scales, the outer one curving obliquely across from the costa to the median vein, sometimes a little beyond, then inward to vein 1, where it forms an obtuse angle, the apex pointing to the base of the wing, then outwardly taking the same general course as the first part of the line to the inner border; within this, and separated by a very narrow line of the general color of the wing are two diffused lines of raised scales; the inner one seems to fuse with the one beyond before reaching costa. This band is followed by a lighter shade, which extends as far

* An ancient tribe of Indians in Mexico.

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as the discal dots, of which there are two of jet-black raised scales on either side of the cell, the lower one being a little more remote from the base of the wing. Outer line scarcely visible in most of the examples, of the general color of the wing, dentate throughout its course, and bordered on each side with a very pale shade of brown, which is darker and broadens on the costa. A row of terminal black dots. The middle of the wing sparingly sprinkled with black scales. Fringes concolorous with the wing; all the wings beneath, hind wings above and abdomen light brown; all the tibiæ and joints of the tibiæ whitish.

District of Columbia, New York, Ohio. Taken by Prof. Forbes at Urbana, O., at electric light, May 12th, 26th and August 2d.

LARVA.—When full grown 16 mm. in length, greenish yellow, with three longitudinal brown stripes on each side of the dorsal line extending from the thoracic to the anal plates, and alternating with narrow lemon-yellow stripes, the last one being on the spiracles. Head, thoracic and anal plates with more or less brown marks and blotches. There is great variation in these larvæ in the intensity of the brown markings, but they can be readily recognized by a black lunate spot on the inner side of the subdorsal tubercle of the third segment behind the thoracic plate.

PUPA.—Length 10 mm., dark brown, rounded anteriorly, posterior end with a small spine on each side extending obliquely out and backward, the end curving backward. In a line between these stand four hooks, much longer than the lateral spines. Abdominal segments, except the last, covered with coarse punctures, except on the posterior edge. Wing covers reaching to the fourth abdominal segment.

The above descriptions are from Prof. Fernald. Prof. Comstock says, in addition, "a large number of larvæ in different stages of growth were found August 12th, drawing together and feeding on the leaves of the honey locust (*Gleditschia triacanthus*), on the department grounds at Washington, D. C. These larvæ transformed to pupæ from the 3d to the 15th of September. When full grown they descend to the surface of the ground, where they spin a loose cocoon of coarse gray silk, which is completely covered with fragments of dried grass leaves and other substances, which so conceals them that they are difficult to be found.

Two of these moths emerged in the latter part of September, but the most of them during the last half of the following May and early part of June, so that it is more than probable they pass the winter in the pupa state on the ground under the trees."

2. **T. finitella** Walk., C. B. M. pt. 27, p. 53, 1863 (*Nephopteryx*).—Dark cinereous. Abdomen and hind wings paler. Palpi erect, rising much higher than the vertex, third joint lanceolate, nearly the length of the second. Fore wings narrow, rounded at the tips, with basal interior and exterior lines irreg-

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ular, incomplete, composed of black scales; submarginal line pale cinereous, undulating; marginal line blackish, interrupted by the veins. Length of body 5—5.5 linés, of the wings 13—14 lines.

Nova Scotia, Florida.

Mr. Ragonot has determined one of my insects as this species, and on it I refer the species to *Tlascala*.

MEROPTERA Grt.

(Type *pravella* Grt.)

Can. Ento. xiv, 29, 1882.

Oreana Hulst, Ento. Am. iv, 115, 1888.

Labial palpi erect, not recurved, reaching beyond head, end member short, heavy; maxillary palpi pencil tufted in ♂; tongue strong, ocelli present; antennæ of ♂ bent above base with scale tuft in bend; tarsi all spinulated. Venation: fore wings 11 veins, 4 and 5 short stemmed, 10 present; hind wings 8 veins, 2 at angle, 3, 4 and 5 stemmed together. Genitalia of ♂: uncus spine short, base bifid, almost a square with spine at middle of outer side; harpe rather broad, with a short lobe towards base above, and with a double spine at extreme upper end; lower plate short triangular, haired; within the anal passage two strong spines together, and another further in; last segment beneath with six tufts of hairs and the central portion modified into a sort of hairs and the central portion modified into a sort of chitinous shield.

1. **M. pravella** Grote, Bull. U. S. Geol. Surv. Terr. iv, 694, 1878 (*Pempelia*); N. A. Ento. i, 10, pl. ii, fig. 8, 1879.—Expands 19—20 mm. Blackish and gray; fore wings whitish gray at base; basal line blackish, diffuse, consisting of two outwardly oblique, slightly waved lines, usually coalesced, but allowing sometimes the narrow gray space between them to be seen. Median field gray; two superposed black dots on cell; outer line whitish, finely dentate, with a little deeper submedian notch, margined on both sides by a blackish shade, a row of terminal black dots; fringes gray. Hind winge testaceous fuscous, rather pale, with pale fringes. Beneath the hind wings are yellowish; fore wings fuscous, with the exterior line marked. Abdomen testaceous fuscous, thorax and head dark grayish. Legs gray, marked outwardly with black.

Maine, Texas, Illinois, Ohio.

Prof. Forbes took the insect at Urbana, Ohio, May 14th, and at Champaign, Ill., July 22d, both at electric light.

2. **M. uvinella** Rag., Diag. N. A. Phyc. p. 8, 1887.—Expands 16 mm. Fore wings gray, base paler; lines white, distinct, edged with blackish, the first oblique, slightly angled on dorsal vein; second line oblique, nearly straight, not rounded nor dentate in the middle as in *pravella* Grt. Discal spots united into a lunule. Abdomen yellowish ochreous.

No locality given; very near the preceding species, and very probably one with it.

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3. **M. unicolorella** Hulst, Ento. Am. iii, 136, 1887 (*Dioryctria*).—Expands 20 mm. Head and thorax even mouse gray. Abdomen with segments ringed, fuscous in front, light ocher fuscous behind. Fore wings even light mouse gray. Basal line whitish, obsolete, except at inner margin. Costa with a patch darker than the ground color. Outer line very near margin very faint, bent outwardly. Hind wings light fuscous mouse gray, subpellucid with black marginal line. Beneath light fuscous, the hind wings lighter.

Canada.

4. **M. canescentella** Hulst, n. sp.—Expands 18 mm. Labial palpi white, stained with fuscous, the front and thorax being of the same color; abdomen fuscous yellow. Fore wings, costa arched, apex sharp, outer angle rounded; color white, washed with light fuscous and sprinkled not very heavily with black scales, altogether giving a light gray appearance; lines indistinct, known only by the shading; the basal oblique, waved, shaded outwardly by a broadish dark line, which at middle runs outward into a blackish dash extending to middle of wing; costa at base, and median space in front of dash, relieved of blackish scale sprinkling, and consequently nearly pure white; outer line very faint, very close to margin, even, parallel to margin. Hind wings white, washed slightly with yellowish fuscous.

Central Texas.

SALEBRIA Zell.

(Type *palumbella* S. V.)

Isis 1846, p. 733; 1848, p. 779; Von Heinemann, Pyr. p. 155, 1865; Grote, Bull. U. S. Geol. Surv. Terr. iv, p. 695, 1878; N. A. Ento. i, 11, 1879; Ragonot, Ento. Mon. Mag. xxii, 19, 1885.

Labial palpi erect, somewhat recurved; maxillary palpi long, bipencil-tufted; tongue long and strong; ocelli present; antennæ of ♂ bent above base with tuft of scales in bend; thorax with tuft of long hairs on each side in front of last segment. Venation: fore wings 11 veins. 4 and 5 separate, 10 separate; hind wings 8 veins. 2 at angle, 3, 4 and 5 stemmed; 6, 7 and 8 separate; cell rather short. Genitalia of ♂: uncus slenderly built, spine not long, bifid below; harpe rather narrow, haired; lower plate, triangular, conical, long haired on outer edge with a strong spine on either side at base; anal opening armed with seven long strong spines arranged somewhat in a circle about it; last segment of abdomen beneath with six tufts of hairs.

Synopsis of Species.

1. Fore wings, except cross lines all reddish ochreous..... **delassalis.**
   " all deep purple red..... **carneella.**
   " not all of one color..... 2.
2. Basal field reddish..... 3.
   " not reddish..... 4.
3. Red distinct, outer cross line distinct..... **tarmitalis.**
   Red faint, outer line indistinct..... **contatella.**
   " " distinct, very dentate..... **celtidella** n. sp.
4. Hind wings light fuscous, nearly white..... 5.
   " dark fuscous..... 7.

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5. Costa strongly arched; wings broad, oval; basal line black on both sides its whole length.....**bifasciella.**
Costa not strongly arched; wings narrow; basal line black shaded in part only.....6.
6. Fore wings light gray; discal spot annulate.....**alicuiella.**
" nearly white; discal spot prominent, black.....**odiosella.**
7. " blackish; lines distinct.....**tenebrosella.**
" gray.....8.
8. " basal field even gray, lighter than rest of wing. **semiobscurella** n. sp.
" uneven in color and with inner basal shadow line.....9.
9. " dull ochreous on inner margin.....**pumilella.**
" with reddish spot on inner margin within basal line and white spot without.....**nubiferella.**
" without ochreous or reddish color.....**annulosella.**

1. **S. pumilella** Rag., Diag. N. A. Phyc. p. 8, 1887.—Expands 17 mm. Fore wings blackish gray, with a brownish tinge, basal area paler, with an ochreous tinge at base on inner margin. First line whitish, ill defined, dilated and very diffuse externally toward inner margin, preceded by a straight, reddish ochreous, black edged band, not reaching the costa. Second line sinuous, rounded in the middle. Discal spots with a tendency to form a convex streak.

Texas, New Mexico, Arizona. Taken in April, May and August.

2. **S. annulosella** Rag., Diag. N. A. Phyc. p. 7, 1887 (*Nephopteryx*); Cat. Ento. Am. v, 115, 1889 (*Salebria*).—Expands 20 mm. Very like *Salebria tenebrosella*, but the wings are distinctly more elongated, much paler, without any traces of red scales; first line hardly paler than the dark gray ground color, distinctly margined internally to the dorsal fold on inner margin, and externally from costa to dorsal fold; basal area darker than the rest; discal spots very distinct.

Texas. Taken in April, May, June, August and September.

3. **S. nubiferella** Rag., Diag. N. A. Phyc. p. 8, 1887.—Expands 21 mm. Very similar to *annulosella*, but broader, blacker; the black edging of the first line on the costa is on a line with the internal black edging on the inner margin, whilst in *annulosella* it goes beyond the exterior edging. Second line distinctly lined with black, dentate and rounded in the middle. Discal spots coalescing into a black streak. A whitish patch after first line on inner margin.

Texas. Taken in May, August and September.

It is with extreme hesitation I retain these three preceding forms as good species. The type forms are not very distinct in *annulosella* and *nubiferella*, and even these do not represent extremes. With over a hundred specimens before me there is every gradation from dark gray to nearly pure white in ground color, a gradual obliteration of the red of *pumilella*, and of the white spot in *annulosella*, and of the amount and apparent position of the basal shadings. All, moreover, have a characteristic marking of the abdomen, in

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that the first segments are ringed with deep black, and often the anal segments, while the intermediate are in shades of yellow and fuscous. They also agree in the ♂ genitalia, and in the ♂ having on the last segment beneath ten tufts, small, five on each side.

4. **S. tenebrosella** Hulst, Ento. Am. iii, 136, October, 1887 (*Nephopteryx*).
quercicolella Rag., Diag. N. A. Phyc. p. 7, December, 1887 (*Nephopteryx*).

Expands 18 mm. Head parts and thorax dark smoky fuscous. Abdomen ringed with fuscous and black. Fore wings blackish fuscous. Basal line broadish, gray, outwardly oblique, broken at the middle. Outer line faint gray, near outer margin, with a long outward sinus at middle. Gray scales at margin. Fringes light fuscous, faintly interlined. Hind wings dark fuscous with black marginal line. Beneath very dark fuscous, a light line along costa. Hind wings as above.

Texas.

Mr. Ragonot's description is as follows:

"Fore wings short, broad, costa rounded, blackish; first line broad, dilated on the inner margin, hoary gray, preceded by some dark red scales, which are thickest on the inner margin. Second line narrower, less distinct, oblique, indented on discal fold. Discal spots distinct, with a tendency to form a lunule, followed by a gray cloud. Marginal spots distinct. Hind wings fuscous."

This insect has, in some respects, much the appearance of *S. nubiferella*, and may be one with it, but it is much darker, and while the markings very nearly correspond, I have no intergradations.

5. **S. semiobscurella** n. sp.—Labial palpi blackish gray; front fuscous; antennæ fuscous; thorax fuscous yellowish, shaded behind; abdomen yellowish, with a fuscous tinge dorsally. Fore wings arched on costa, narrow at base, broad outwardly, angles distinct; basal field even light gray, slightly darker at costa; middle and outer fields even dark gray; discal spots faint; lines indistinct, the basal only evidenced in a broad blackish shading at edging of basal field and gradually fading into the middle field; outer line near margin angulated. Hind wings yellow fuscous, edge fuscous.

Central Texas. Taken in April and May.

This species is catalogued by Mr. Ragonot under his name. I have no knowledge that it has been described. I have a specimen identified by him as the species, and describe it to give it a place in this paper.

6. **S. subfuscella** Rag., Diag. N. A. Phyc. p. 8, 1887.—Expands 22 mm. Fore wings narrow, elongate, blackish gray, with a slight purple tint, inner margin dark red at base. First line replaced by a broad, straight, slightly oblique black band, externally blending into the ground color, and preceded by a grayish band. Second line dark grayish, sinuous, edged with black. Discal spots with a tendency to coalescing.

This insect is described by Mr. Ragonot in his Diag. N. A. Phyc., but no locality is given. As in that paper insects from the West

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Indies and Mexico were described as North American, it is possible that this, and other insects without locality, may not belong to the North American fauna. I have never seen the insect.

7. **S. contatella** Grt., N. A. Ento. i, 49, 1880; i, 68, 1880, pl. 5, fig. 5 (*Pempelia*), Dept. Agric. Rept. 1880, p. 261.

? *virgatella* Clem., Proc. Acad. Nat. Sci. Phil. 1860, p. 205.

Expands 20—26 mm. Blackish and gray. Fore wings with a faint and inconstant shading of red at base, usually absent. Basal field of the wing whitish gray, before the line shaded with blackish. Inner line continuous, whitish gray, followed by a blackish line, twice indented, usually roundedly exserted in the middle. Median space washed with gray anteriorly and along costa. Discal mark consisting of two generally fused dark dots, obliquely placed, slightly relieved by whitish. Outer line pale, tolerably even, indented below costa, opposite cell, and again less distinctly on submedian fold. A row of blackish terminal points; fringes concolorous. There is a more or less evident median shade, which obliquely margins in an irregular fashion the outer and darker portion of the median space; sometimes a faint reddish tinge is perceptible about this shade line, on submedian space. Thorax ashen, sometimes faintly ruddy. Hind wings subpellucid, shaded with fuscous, darker in the ♀; fringes paler, neatly interlined near the base.

New England, New York, District of Columbia, Canada, Ohio, Illinois.

Var. **quinquepunctella** Grt., N. A. Ento. i, 50, 1880; i, 68, pl. 5, fig. 6.

Expands 21—23 mm. Closely allied to *contatella*. It differs by its smaller size, the last two scallops of the interior line more or less evidently pure white, and contrasting; the line is followed by three dots, one below costa indistinct and sometimes absent; the second at the median vein at the inception of the white portion of the line; the third on submedian fold. These dots seem to be the remainder of the blackish shade following the white portion of the line. The discal dots are separate: the outer line is more denticulate; the wing is more noticeably stained with red. Hind wings and under surface as in *contatella*.

Canada, New England, New York, District of Columbia.

Prof. Comstock gives the following description of larva and pupa of *contatella* and its variety:

LARVA.—"The full grown larvæ were nearly an inch in length, of a grayish green color above, more or less tinged with pink, especially on the third and fourth segments and between the folds; under side pea-green; some of the larvæ were of a yellowish green color, darker green anteriorly, head yellowish brown with irregular black blotches, thoracic plate green, with a few black spots, anterior margin yellowish, posterior pale brownish.

PUPA.—Length 10 mm., rather stout, color chestnut-brown; anterior end rounded; posterior with a minute beak curving down slightly and armed at the end on each side with a sharp, stout spine, extending obliquely out and downwards. In a row between these at equal distances are four slim filaments, much longer than the spines and hooked at the end. The abdominal segments are

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covered above and below with coarse punctures, except on the posterior edge. while the wing covers, head and thorax above are impressed with irregular striæ.

"On the 29th of August several larvæ were found in the Department grounds on the locust (*Robinia pseudacacia*), drawing the leaves together, the side of one to that of the other. The larvæ transformed to pupæ between the 5th and 8th of September, and emerged in the following May. The pupa was spun up in a tough silken cocoon on the surface of the ground, to which earth and fragments of dried leaves and grass were adhering."

Mr. Beutenmüller has also raised the larva on locust, and from him I have obtained the following description, which gives some additional items:

"Head jet-black, shining, cervical shield black shining; body pale green, with about four or five long stripes darker than the ground color. At the side there are rows of minute piliferous spots each bearing a light brown hair; underside of body as above; the first segment dull black. Length 15 mm. Larva taken June 15th, imago emerged July 8th. The segments of the body gradually decrease in size towards the posterior part of the body.

"Prof. Forbes, of Illinois, writes me he has taken the insect at Urbana, Ohio, from May 10–23 at electric light; August 3d at 'sugar,' and that he bred the insect from Wistaria, the larva being taken July 13th, the imago emerging August 5th."

8. **S. tarmitalis** Hulst, Trans Am. Ento. Soc. xii, 162, 1886 (*Pempelia*).—Expands 25 mm. Palpi and head black; collar white; thorax black above, light fuscous laterally; all the black portions slightly peppered with light fuscous scales. Abdomen, first segment black above, light fuscous on sides, next segment black the rest dark fuscous with a reddish shade; fore wings reddish brown at base, reaching one-fourth the length of wing, edged outwardly from costa to inner margin by a faint white line; a median dash of white on outer portion of base very faint; rest of wing dark fuscous, slightly ochreous towards outer angle; merging with the white line limiting the basal color outwardly is a more prominent cinereous line sinuous, running obliquely outward, inclosing between it and first line a patch of deep fuscous; two black spots on discal space, one anterior to the other; outer line cinereous, sinuous, dentate. faint anteriorly, obsolete posteriorly; fringe fuscous, end of scales white; hind wings pellucid fuscous; marginal line black; beneath even fuscous, hind wings lighter, fore wings with outer line reflected.

Colorado.

9. **S. carneella** Hulst, Ento. Am. ii, 131, 1887 (*Nephopteryx*).—Expands 23—25 mm. Head fuscous black. Collar, thorax and abdomen even bluish gray, washed with maroon-red. Fore wings bluish gray, marked with light maroon-red. This is especially marked on the borders of the gray cross lines, and is

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most lacking just at end of basal field, along outer margin, and costally and centrally on the middle field. On either side of the basal cross line there are more or less black scales. A faint fuscous marginal line. Hind wings fuscous, rather yellowish, fuscous margined outwardly. Beneath fuscous, smooth, somewhat reddish on fore wings, lightening posteriorly on hind wings.

Maine, Massachusetts.

I have also a female from New Nexico which may be this species. The specimens from Maine were bred from Willow, but under what conditions I do not know. My reference, Ento. Am. v, 156, of *Neph. inquilinella* Rag. is explained under that species.

10. **S. delassalis** Hulst, Trans. Am. Ento. Soc. xiii, 161, 1886 (*Nephopteryx*).
fernaldi Rag., Diag. N. A. Phyc. p. 9. 1887.

Expands 24 mm. Palpi fuscous, reddish in front. Thorax reddish ochreous. Abdomen fuscous: fore wings reddish ochreous, quite even; costa on outer half narrowly white; first line scarcely perceptible anteriorly, whitish ochreous posteriorly with rather heavy black shadings; within and beyond these shadings indistinct whitish ochreous spots; outer line near margin evenly and strongly curved outward; hind wings fuscous outwardly, shading to light translucent fuscous towards base; a dark marginal line present; beneath fore wings fuscous, with a faint reddish tinge; outer space a shade the lighter; hind wings as above; fringes above light fuscous, darker at base; light fuscous below.

Nevada, Colorado, New Mexico. Arizona. Specimens from New Mexico were taken in August and September.

11. **S. bifasciella** Hulst, Ento. Am. iii, 132, 1887 (*Nephopteryx*).— Expands 20 mm. Head, thorax and fore wings light whitish gray, dusted with black. Abdomen ocher fuscous. Fore wings with basal band of ground color, edged on both sides with distinct black shadow lines once angled outwardly. Outer line near margin of ground color, with narrow black shadow lines, especially distinct at costa; the lines slightly bent. Marginal line of dentate black points. Hind wings light yellowish fuscous, pellucid. Beneath fore wings light fuscous, hind wings as above.

Arizona. First week in July.

This insect has the fore wings much more arched costally, and they are more oval in outline than is usual in the genus.

12. **S. aliculella** Hulst, Ento. Am. iii, 135, October, 1887 (*Myelois*).
oberthueriella Rag., Diag. N. A. Phyc. p. 9, December, 1887.

Expands 21—23 mm. Labial palpi gray white in front, black at tip. Maxillary palpi orange fuscous. Head gray. Thorax gray. Abdomen ocher fuscous or fuscous. Fore wings white, heavily dusted with black scales, giving a gray appearance. Base blackish. Basal line white, angulated outwardly, with a heavy black marking outwardly at costa, sometimes extending on disc to discal ring; within which a reddish band sometimes quite obsolete. A discal circle of black quite large on middle field, this often very indistinct. Outer line white, fine, angulated at middle, then curved to inner margin, lined finely with black

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within, with more diffuse fuscous or reddish fuscous without. A row of marginal black points generally strongly dentate at middle portion of wing, and reaching sometimes to outer shadow line. A short longitudinal black dash at the center of the outer middle field edged with white. Hind wings light ocher fuscous, pellucid. Beneath fuscous on fore wings. Hind wings as above.

Arizona.

This insect was taken by me at Prescott, Arizona, under circumstances which make it almost certain that the food-plant is a species of *Ceanothus*. They were taken the first week in July, and were flying in and about the bushes during the hot sunshine of midday.

13. **S. odiosella** Hulst, Ento. Am. iii, 132, 1887 (*Nephopteryx*).—Expands 24—25 mm. Head, thorax and fore wings white, with scattered black and fuscous scales, giving a brownish cast. Maxillary palpi with hair pencil at end, of a yellow brown color. Abdomen rather more fuscous than thorax. Fore wings with white basal band, shadowed at costa outwardly, and at inner margin inwardly, with blackish, which is broad at the respective margins, and becomes obsolete before crossing the wing. A black diffuse, somewhat kidney-shaped discal spot. Outer line white, shadowed with black on both sides, the shadows becoming broad and heavy at costa. The line is more bent than usual at the middle. A marginal row of black spots pointed inwardly. Hind wings white, with an ocher cast, pellucid. Beneath fore wings faintly fuscous, yellowish along costa. Hind wings as above.

Central Texas.

14. **S. celtidella** n. sp.—Female expands 19 mm. Labial palpi ochreous fuscous, fuscous at tip; head ochreous; thorax dark fuscous; abdomen ochreous, annulated with fuscous; fore wings ochreous; base with a reddish tinge, otherwise clear ochreous, then a broad blackish band tinged with brownish red posteriorly, extending to basal line; basal line fine, rather broken, very much and irregularly waved dentate, and at the middle of the wing; middle field blackish, reddish along inner margin, opening to ochreous gray at discal spots; the upper discal spot faint, the lower distinct; outer line very wavy dentate, broken, whitish, the color showing as an edging for the shading scallops; outer shading of long, dentate, jet-black dashes on veins; outer field deep ochreous, marginal spots jet-black, rather large; fringe fuscous gray. Hind wings dark fuscous, veins and margin darker.

Mr. Beutenmüller has raised this insect upon *Celtis occidentalis*. He has furnished me with the following description:

"LARVA.—Head pitchy-black, flattened, with an irregular dirty white, oblique stripe on each side, running from labrum to collar at summit; there are also other fine irregular white markings present; body pale green, covered with pea-green, equidistant, longitudinal stripes, as broad as the intervening spaces. Cervical shield pitchy-black, on which the stripes of the body continue as dirty white; along the subdorsal region on both sides a row of minute black spots, and two rows placed closely together on the sides, which are also minute and jet-black; body beneath green, without markings; the color of the cervical shield

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extends around the segment. Thoracic feet black, abdominal and anal legs green. Length 18--19 mm. It lives upon *Celtis occidentalis*, without larval case, drawing together the terminal leaves and living within."

Full grown larva taken August 27th. Mr. Beutenmüller made no note of the time of the emergence of the larva.

LAODAMIA Rag.

(Type *fæcella* Zell.)

Nouv. gen. espec. Phyc. p. 22, 1888.

Differs from *Salebria* first, in lacking the thoracic tuftings below; second, in the hind wings vein 2 is near the angle and the cell is short.

Differs from *Elasmopalpus* in that the wings are much wider, and in the hind wings 2 is near the angle and the cell is short.

I do not think the genus has very good reasons for existing. Indeed, I see no very strong reasons why *Salebria* and *Elasmopalpus* should be distinct.

1. **L. fusca** Haw., Lep. Brit. p. 493, 1828; Steph., Brit. Ent. iv, p. 310, 1834 (*Phycita*); Hood, f. 1683, 1839; Stainton, Man. ii, 176, 1859; Von Heinemann, Pyr. p. 156, 1865 (*Pempelia*); Grote, Bull. U. S. Geol. Surv. iv, 695, 1878 (*Salebria*); N. A. Ento. i, 11, pl. ii, fig. 7, 1879; Moeschler, Stet. Ento. Zeit. 1880, p. 393; Verh. Zool.-Bot. Ges., Wien, 1884, p. 309; Westwood and Humphrey, p. 232, pl. 115, fig. 29, 1839; Wall., Pyr. p. 1036, 1859; Bonwst, iii, p. 201, N. 36; Snellen, Vlin. Neth. Micro. i, 135; Frei., Lep. Sch. p. 274, 1880.

carbonariella Fischer, von Roeslerstamm, Abbil. Schm. 60, i, 157; Zeller, Isis 1846, p. 772, 1848, 747; Herrich-Schaeffer Sys. Bear. iv, p. 76; Dupon., Noct. 7, p. 292.

posticella Zetterstdb, Ins. Lap. p. 976.

janthinella Duponchel, x, p. p. 235, pl. 281, fig. 2.

mæstella Walk., C. B. M. pt. 27, p. 53, 1863.

undulatella Wlk., C. B. M. pt. 35, 1711, 1866.

frigidella Pack., Ann. N. Y. Lyc. N. H. x, 271, 1873.

cacabella Hulst, Ento. Am. iii, 133, 1887.

Labial palpi blackish fuscous, as is also head and thorax; fore wings blackish fuscous to fuscous gray, rather even and unbroken; lines generally distinct; the inner oblique dentate; the outer pretty well out, rather rounded out in middle, dentate with strong angles at beginning of bend on each end; discal spots coalescing, black, more or less indistinct; hind wings fuscous to dark fuscous, lines and margin darker; last segment of abdomen below with two tufts.

Larva said to live in Europe on *Vaccinium myrtilum*, and the insect flies in June and July.

I have received from Mr. Moeschler specimens labeled *Myelois altensis* Wocke, which were received by Mr. Moeschler from Lab-

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rador. They are not *Myelois*, but *Salebria fusca*, so that I think I am justified in not catalogueing *Myelois altensis* as an American species on Moeschler's authority.

ELASMOPALPUS Blanch.

(Type *lignosellus* Zell.)

Gay, Hist. Chili, Zool. vii, 104, 1852.

Labial palpi erect, not recurved, rather heavily scaled, end member very short, about one-eighth middle; maxillary palpi pencil tufted; tongue strong; ocelli present: antennæ bent above base, with a heavy tuft of scales in bend. Fore wings narrow, subparallel. Genitalia of ♂; uncus longer and slenderer than usual, bifid at base, these parts arched, the spine long; harpæ broad, with long hairs along upper edge, forming somewhat of an anal tuft, a strong bent spine at base; lower plate conical; within entrance a long slender bent spine; last segment of abdomen beneath with two tufts of hair. Venation: fore wings 11 veins, 4 and 5 separate, 10 separate; hind wings 2 more or less distant from angle, 4 and 5 stemmed, 6, 7 and 8 stemmed, cell rather short.

The genitalia of some of the species (*petrellus, floridellus, melanellus*) differ very radically from those of *lignosellus*, the type of the genus, and indeed from all the rest of the Phycitidæ. The uncus and lower plate are much after the ordinary pattern, but the harpæ are entirely different in construction in the ♂. The harpæ are divided to the base into two long, slender, almost linear lobes, which stand at a strong angle from each other. The upper lobe is armed with quite long hairs, while the lower is without hairs, but has at the end a development into three very short incurved teeth.

Synopsis of Species.

Color reddish brown ..... **petrellus.**
" blackish, with middle of wing yellowish or reddish; lines obsolete. **lignosellus.**
" entirely blackish; lines obsolete ..... **tartarellus.**
" " lines distinct ..... **melanellus** n. sp.
" gray; a reddish band beyond basal line ..... **floridellus** n. sp.
" " no reddish band ..... **decoralis.**

1. **E. melanellus** n. sp.—Expands 23—25 mm. Labial palpi, head and thorax dull black; abdomen with an ocher cast and annulated with lighter color; fore wings even dull blackish, with a slight sprinkling of gray scales a little more pronounced along inner margin and on outer field; basal line very faint; outer line distinct, grayish, angulated below costa, then straight, waved-dentate to inner margin; discal spots jet-black, evident; marginal dots present at middle of border; hind wings dark fuscous, veins and border black.

Florida, April.

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This resembles *petrellus* in shape, size and lines, and may be a black variety of that species, but with a considerable number of specimens I have no intergradations.

2. **E. petrellus** Zell., Isis 1846, p. 771; 1848, p. 886; Verh. Zool.-Bot. Ges. Wien. 1872, p. 545 (Beit. i, 99), (*Pempelia*).
erectalis Wlk., Cat. B. Mus. pt. 27, p. 42, 1863 (*Trachonitis*).
rufinalis Walk., C. B. M. pt. 27, p. 56, 1863 (*Nephopteryx*).
hapsella Hulst, Ento. Am. iii, 132, 1887 (*Nephopteryx*).
obsipella Hulst, Ento. Am. iv, 118, 1888 (*Honora*).

Expands 20—26 mm. Labial palpi reddish; tongue white; head and thorax reddish with fuscous tinge; fore wings brown, with lighter, almost light gray costal stripe, pink towards base; base of wing deep red; basal line a reddish band edged on either side with a more or less broken dentate line, the inner bordered basally with a broad blackish band; outer line distinct, not far from margin, finely dentate; discal spots evident. Hind wings light fuscous.

Florida, Texas.

This species is quite variable in depth of color and distinctness of its markings; some specimens have considerable gray scattered over the fore wings, others are quite decidedly brown with costal stripe not very evident. Zeller's specimens of *petrellus*, with his labels in the Cambridge Museum, are this species, not *lignosellus*, as Ragonot catalogues the insect. It seems impossible, in any case, that Zeller could have described the same insect under four names. I have received the species from Florida in April, and from Texas in September, so it may hibernate.

3. **E. decoralis** Walk., C. B. M. pt. 27, p. 42, 1863 (*Nephopteryx*).
metagrammalis Wlk., C. B. M. pt. 27, p. 54, 1863 (*Nephopteryx*).

I do not know this insect. The reference is by Mr. Ragonot. Walker's description is:

"Cinereous, rather slender, with a tinge of fawn color. Palpi stout, obliquely ascending, rising a little higher than the vertex; third joint conical, one-sixth length of second. Antennæ dilated at base. Abdomen extending a little beyond the hind wings, with two lanceolate apical appendages. Fore wings narrow, rounded at the tips, irregularly powdered with pale cinereous; a black mark on the exterior border before the middle, and two or three minute, indistinct, black marks in the exterior part of the disc. Marginal points black; exterior border slightly convex, rather oblique. Hind wings pale cinereous, with an æneous tinge. Length of body 6 lines; of the wings 14—16 lines.

"United States."

4. **E. floridellus** n. sp.—Expands 24—26 mm. Labial palpi, head and thorax fuscous gray, the thorax washed with reddish violet; abdomen yellow fuscous; fore wings rather even light gray, pretty heavily powdered with blackish, giving a blue-gray appearance, darkest along costa apically, and in outer

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middle field along inner margin; basal line faint, edged outwardly by broad reddish, more prominent along inner margin; outer line indistinct, gray, angulate, inner black edging of short dashes on veins; discal spots faint. Hind wings yellowish fuscous.

Taken at Charlotte Harbor, Fla., in April by Mrs. A. T. Slosson, of New York.

This may be *decoralis* Walk. The two lanceolate appendages which he speaks of in that species may be the lobes of the genitalia, which, in *floridellus*, are as in *petrellus*, and distinctly protrude.

5. **E. lignosellus** Zell., Isis 1848, p. 883 (*Pempelia*); Verh., Zool.-bot. Ges. Wien, 1872, p. 544 (Beit. pt. 1, p. 98); 1874, p. 430 (Lep. West. Amer. p. 8); Hor. Soc. Ento. Ros. xvi, 180; Berg., Ann. Soc. Argent. 1877, p. 28; Bull. Mosc. 1876, p. 38; Dept. Agric. Rept. 1881—82, p. 142.

angustellus Blanch., Gay, Hist. Chili, Zool. vii, 105, 105, 1852.

Expands 17—22 mm. Head and thorax blackish; abdomen fuscous to yellowish; fore wings very narrow, outer margin oblique, inner margin waved; lines obsolete, color all around the edge of the wing from a narrow edging to a complete covering of the wing blackish to lead color. The inner portion yellow ochreous. Hind wings transparent fuscous white, darker on veins and edge.

Texas, Florida. Also taken in the Bahamas, Venezuela, Buenos Ayres, Patagonia and Chili, S. A.

I have received specimens taken in Texas in March and August. Zeller received them from Texas taken in July and August.

Var. **incautellus** Zell., Verh., Zool.-bot. Ges. Wien, 1872, p. 544 (Beit. i, 99) (*Pempelia*).

Differs from *lignosellus* in having the central portion of the wing bright reddish.

Var. **tartarellus** Zell., Verh. Zool.-bot. Ges. Wien, 1872, p. 544 (Beit. i, 98) (*Pempelia*); Hor. Soc. Ento. Mosc. xvi, 180.

carbonella Hulst, Ento. Am. iv, 117, 1888 (*Dasypyga*).

This variety differs only in having the fore wings of a solid blackish, or rather plumbago color.

SELAGIA Hüb.

(Type *argyrella* Fab.)

Verh., p. 371, 1816; Zeller, Isis 1846, p. 732; 1848, p. 752; von Heinemann, Pyr. 153, 1865; Ragonot, Ento. Mon. Mag. xxii, 19, 1885.

Labial palpi porrect or drooping, maxillary palpi distinct; tongue strong; ocelli present; antennæ bent above base with ridge of scales in bend. Legs: tarsi all spinulated; thorax with tuft of long hairs on each side below in front of last segment. Genitalia of ♂ very

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nearly as *Salebria*, differing only in that there is but one strong spine at beginning of anal opening, and one very long twisted spine far within; the last segment of abdomen beneath has two large hair tufts. Venation: fore wings 11 veins, 4 and 5 separate, 10 separate; hind wings 8 veins, 2 near angle; 3 separate, 4 and 5 stemmed, 6 and 7 stemmed.

1. **S. lithosella** Rag., Diag. N. A. Phyc. p. 9, 1887.—Expands 32 mm. Fore wings narrow, elongate, pale yellowish ochreous, costa indistinctly paler. A brown spot on the dorsal vein indicates the first line, between which and the anal angle the inner margin is dusted with brown. The lower discal spot and marginal points minute, distinct.

Arizona.

ANORISTIA Rag.

(Type *umbrifasciella* Rag.)

Ann. Soc. Ento. France, 1887, p. 236.

Labial palpi oblique, thick, squamose; last member very short, deflected; maxillary palpi invisible; antennæ of ♂ pubescent, very slightly bent and hardly crenulate above base; fore wings 4 and 5 separate; hind wings 8 veins, 3 and 4 stemmed; appearance of *Epischnia*.

I do not know the type or the American species. The diagnosis of Mr. Ragonot gives no characters that will properly separate this from several other genera. The fore wings probably have 11 veins, but this is not mentioned. Even if the genus be a good one it is uncertain whether it is represented in this country, inasmuch as both species described under it were described from females only, and till the male is known no species can be more than provisionally located save as there is some departure from the structure known to occur in other genera in both sexes.

1. **A. flavidorsella** Rag., Diag. N. A. Phyc. p. 9, 1887.—Expands 15 mm. Fore wings pale gray, finely and sparingly dusted with black; lines whitish distinctly bordered in median area with fine black lines, the first oblique, sinuous, preceded by a broad blackish band, ill defined towards the base; second line sinuous, rounded and dentate in the middle, much indented on the folds. Discal and marginal spots pretty distinct. Inner margin at base yellowish. Hind wings yellowish white. Abdomen yellow.

Arizona; Sonora, Mex.

2. **A. olivella** Hulst.—Expands 24 mm. Palpi whitish; head, thorax, abdomen and fore wings light fuscous gray, scatteringly and coarsely dusted with a few black scales, the whole washed with a light olive shading; the black scales are a little more plentiful at the base, along inner margin, and at apex; basal

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line whitish, merely a break in the slight dusting of black; outer line formed as the basal, but rendered distinct by a heavier shading of the black within, oblique, subparallel with outer margin, with one inner angulation one-third from costa; hind wings olive whitish.

The Needles, Cal. Taken in June at light.

This species was placed in *Anoristia* because it seemed the maxillary palpi were wanting. I find, however, they are present, though very small, so it does not belong here; but it is best, perhaps, to do no more guessing till the male is discovered and the proper location can be given. As I said before I am not aware of a single instance among American Phycitidæ where the maxillary palpi are wanting.

PYLA Grote.

(Type *scintallans* Grt.)

Check List 1882, pp. 55, 66; Pap. i, 18, 1881; Rag., Diag. N. A. Phyc. p. 9, 1887.

Labial palpi oblique, third member deflexed, second member internally grooved, with a thin pencil of brownish gray scales; maxillary palpi small; tongue strong; ocelli present distinct; antennæ of ♂ strongly bent above base, a small tuft of scales in the band. Genitalia of ♂: uncus light, spine short, harpe, rather narrow, haired, with one heavy, and two or three short spines at base; lower plate quadrate, conical at end, haired at edge; anal opening defended with toothed plate on each side, with several spines within resting on heavy chitinous plate; last segment of abdomen with two heavy tufts of hair. Venation: fore wings 11 veins, 4 and 5 separate, 10 separate; hind wings 8 veins, 2 distant from angle, 3 stemmed with 4 and 5, 6 stemmed with 7, 8 separate, cell short.

Synopsis of Species.

Black, with coppery reflection ..... **scintallans.**
Bronze-green ..... **æneoviridella.**

1. **P. scintallans** Grote, Papilio i, 18, 1881 (*Nephopteryx*).—Expands 20--24 mm. The entire insect is blackish immaculate, or with outer line faintly suggested, shining; head, thorax and fore wings with coppery violet reflections.

Sierra Nevada Mountains, Cal.

2. **P. æneoviridella** Rag., Diag. N. A. Phyc. p. 8, 1887.—Expands 27 mm. Differs from *scintallans* only in that the color is bronzy green, slightly tinged with coppery on costa.

New York.

These two species are so near that I have little doubt they are at most variations of one species only.

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EPISCHNIA Hüb.

(Type *prodromella* Hüb.)

Verz. p. 370, 1816; Zeller, Isis 1839, p. 178; 1848, p. 585, 644, 737; Herrich-Schaeffer, Sys. Bear. iv, p. 89, 1849; von Heinemann, Pyr. p. 171, 1865; Rag., Ento. Mag. xxii, 19, 1885; Meyrick, Proc. Linn. Soc. N. S. W. iv, p. 229, 1879.

Labial palpi long, horizontal, middle member somewhat bent, end member nearly as long as middle; maxillary palpi distinct; tongue long, strong; antennæ bent above base, without tuft, but with ridge of teeth; legs slender, tarsi spinulated, fore tibia shorter than upper tarsus; thorax with tuft of long hairs on each side below, generally hidden between first and second segments behind fore coxæ; fore wings long, subparallel, angles rounded. Genitalia of ♂: uncus stout, heavy, rather dull; harpe broad, without clasper; lower plate broad, rounded at end, curved upon each side, armed with strong inward turned hairs. Venation: fore wings 11 veins, 4 and 5 separate, 10 separate; hind wings 8 veins, 2 at angle; 3, 4 and 5 stemmed; 6 and 7 stemmed.

Synopsis of Species.

1. Fore wings white ..... **ruderella.**
   " not whitish ..... 2.
2. " with broad costal stripe ..... 3.
   " with no costal stripe ..... **granitella.**
3. Cross lines wanting ..... **boisduvaliella.**
   One or both cross lines present ..... 4.
4. Hind wings white ..... **subcostella.**
   " brown-gray ..... **fulvirugella.**

1. **E. ruderella** Rag., Diag. N. A. Phyc. p. 9, 1887.—Expands 24 mm. Chalk-white, dusted with blackish scales, especially along the costa and the veins. First line elbowed, formed of dark gray spots on the veins; second line white indistinct. Lower discal spot blackish, elongate. Hind wings yellowish ochreous, fringes white.

No locality is given.

2. **E. granitella** Rag., Diag. N. A. Phyc. p. 9, 1887.—Expands 29 mm. Fore wings elongate, very narrow at base, rounded in the middle, gray, much dusted with blackish brown, especially in the cell and between the nervures; lines indistinct, shadowy, blackish brown, the first oblique, rounded, not reaching the costa; the second rounded, nearly parallel with the hind margin. Discal spots indistinct. Hind wings brownish, fringes white.

No locality is given with this species.

3. **E. boisduvaliella** Guen., Ann. Soc. Ento. France 1845, 318 (Index Meth. p. 80); Rag., Ento. Mon. Mag. xxii, 23, 1885.

farrella Curt., Ann. Nat. Hist. iv, 114, 1850; Stain. Cat. Sup. p. 1, 1851; Fologne Ann. Soc. Ento. Belg. 1864, p. 273; Zell., Verh. Zool.-Bot. Ges. Wien,

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1872, p. 558 (Beit. i, 112); Wood, 2d ed. fig. 1755; Stain., Man. 2, p. 168; Ento. Mon. Mag. viii, p. 290; Snellen, Tidsk. xi, p. 50, pl. 1, fig. 1 (1868); v. Nolcken, Stett. Ento. Z. 1868, p. 89; Snellen, Vlin. Neth. Micro. i, p. 145; Frei., Lep. Sch. p. 275. 1880; Büttner, Stett. Ento. Zeit. 1880, p. 393; Moesch., Verh. Zool.-Bot. Ges. Wien. 1884, p. 309.

lafauryella Constant, Ann. Soc. Ento. France, 1865. p. 189, pl. vii, fig. 1 (*Myelois*): *leucoloma* Snell., Tidsk. ix, p. 61, 1866.

Labial palpi light gray, powdered with fuscous; head and antennæ grayish fuscous; thorax ochreous fuscous; fore wings ochreous fuscous or fawn color, the costa narrowly fuscous except basally, followed by a broad white stripe reaching costa basally, and extending from base to apex; behind this along outer margin and along inner margin the wing is slightly darker; lines obsolete, discal spots faint. Hind wings light fuscous to fuscous.

Massachusetts, Texas.

Büttner says the larva in Germany lives in September on *Anthyllis vulneraria*, passing the winter in a spherical cocoon made at the surface of the ground, deserting this the next spring, then spinning another longish oval cocoon and becoming a pupa to emerge in three weeks in June as an imago.

4. **E. albocostalis** Hulst, Trans. Am. Ent. Soc. xiii, 164, 1886 (*Ephestia*).—Expands 28 mm. Palpi cinereous, indistinctly annulated with whitish; head and collar snowy cinereous; thorax and abdomen dark fuscous cinereous; fore wings with a snow-white costal band, occupying the space to the subcostal vein, and reaching outwardly to a point nearly at apex, fading on the outer half along costa into mouse color; the rest of the wing dark fuscous, basally and medially, fading behind and outwardly into fuscous mouse color, a very fine submedian white dash present on middle portion; fringe blue-gray, finely interlined with white; hind wings fuscous outwardly, fading to light fuscous basally; fringe light fuscous; beneath dark fuscous, with a lengthened ante-median white spot, crowned with ochreous subcostally; hind wings as above.

California.

I sent the type to Mr. Ragonot, who returned it, marked *Epischnia boisduvaliella*. It may be a variety of that species, but it is not the typical form. It differs from what, by Dr. Staudinger and Mr. Ragonot, has been sent me as the typical *boisduvaliella* as follows: It is always very much larger and different entirely in color on head, thorax, wings and abdomen. The costal stripe does not reach beyond the middle field, and there is a grayish stripe on vein 1 of fore wings.

I am aware the European insect varies in color and closely approaches this, but I am not aware that it is ever so dark, and it is never so large.

5. **E. subcostella** Rag., Diag. N. A. Phyc. p. 10, 1889.—Expands 26 mm. Fore wings narrow, pale gray, washed with brownish to the second line, darker

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and dusted with black scales above the dorsal fold and on the inner margin; dorsal fold tawny; a pure white streak from the base along the costa to and near the apex; the extreme costa, from the middle to the apex, dusted with blackish. First line indicated by a white spot on the dorsal vein; second line with an acute angle in the middle, rendered visible by the darker area; hind wings pure white.

Utah.

6. **E. fulvirugella** Rag., Diag. N. A. Phyc. p. 10.—Expands 30 mm. Similar to *subcostella*, but not so dark, not dusted with black; the dorsal and discal folds tawny, the costal stripe finely dusted with blackish; cross lines quite indistinct; lower discal spot distinct; hind wings unicolorous, pale brownish gray, fringes paler.

No locality is given, and I have never seen the species.

PIMA* Hulst.
(Type *albiplagiatella* Pack.)

Ento. Am. iv, 114, 1888.

Differs materially from *Epischnia* in lacking the tufts of hairs on the thorax below; the genitalia of ♂ also differ in that the harpæ are armed at base with strong spines, and the uncus at its basal division is quadrate with the spine set in the middle of the outer edge. Venation as in *Epischnia*.

1. **P. albiplagiatella** Pack., Ann. N. Y. Lyc. Nat. Hist. x, 269, 1873.
fosterella Hulst, Ento. Am. iv, 114, 1888

Expands 25 mm. Palpi light gray; head light gray, whitish along eyes, ocherish behind; thorax ocherish, lighter on dorsum; abdomen light ocher, white on first segment, and on the rest on dorsum only; fore wings almost pure white along costa to apex, behind this very narrowly edged with black, then the rest ochreous, darker anteriorly and basally; hind wings clouded white, shining, beneath as above with colors shaded with fuscous.

Colorado.

MEGASIS Guen.
(Type *illignella* Zell.)

Ann. Soc. Ento. France, 1845, p. 309 (Index Meth. p. 71); von Heinemann, Pyr. 170, 1865.

Labial palpi nearly horizontal, rather long, end member one-third second, second and basal members rather heavily scaled; maxillary palpi distinct, filiform; tongue long, strong; ocelli present; antennæ of ♂ simple or slightly bent, crenulate pubescent. Legs: tarsi all spinulated. Wings long, rounded. Genitalia of ♂: uncus short; harpe slender, without spine; lower plate spatulate conical; within, below base, and seemingly guarding outer passage, four stout heavy

* A tribe of Indians in Arizona.

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spines. Venation: fore wings 11 veins, 4 and 5 separate, 10 separate or stemmed; hind wings 2 near angle; 3 separate or stemmed with 4 and 5, 6 stemmed with 7.

Synopsis of Species.

Fore wings brownish ochreous along inner margin.....**excantalis.**
" fuscous brown " " .....**edwardsialis.**
" black all over.....**atrella** n. sp.

1. **M. edwardsialis** Hulst, Trans. Am. Ento. Soc. xiii, 163, 1886 (*Megaphycis*); Ento. Am. v, 156, 1889.

polyphemella Rag., Diag. N. A. Phyc. p. 10, 1887.

Expands from 35 to 45 mm. Head, thorax, abdomen and fore wings fuscous to blackish fuscous; post-discal and submedian veins lined with black; an outer light fuscous cross line, before which all veins have a short black dash continued beyond on outer space; hind wings lighter dull fuscous; beneath even fuscous.

Nevada.

The following is Mr. Ragonot's description:

"Expands ♂ 46 mm. ♀ 36 mm. Fore wings narrower at base, glossy brownish gray, dusted with whitish scales, the veins dusted with black scales, the veins dusted with black scales, marginal spots distinct, discal spots illy-defined. Cross lines in the male hardly discernible; in the female very distinct, whitish, broadly edged with black in median area; first line oblique, irregular; second line oblique, much indented on the folds."

Mr. Ragonot sent me a specimen of his *polyphemella*, and it was the same as my *edwardsialis*.

2. **M. excantalis** Hulst, Trans. Am. Ento. Soc. xiii, 163, 1886 (*Anerastia*); Ento. Am. v, 156, 1889.

pullatella Rag., N. A. Phyc. p. 9, 1887.

Expands 22—36 mm. Palpi light fuscous; the rest of the insect, except abdomen and hind wings, soft fuscous brown, the middle field of fore wings perceptably darker. Abdomen soft blackish fuscous; hind wings fuscous, with a faint darker marginal line; beneath concolorous, with hind wings above.

California.

Mr. Ragonot's description is as follows:

"Expands ♂ 36 mm. ♀ 24 mm. Male very like *polyphemella*, but less dusted with white, less glossy, browner, much dusted and washed with black, especially in basal area and along the costa and nervures; dorsal fold brownish ochreous. Lines more distinct, pale, not margined. The female is black, very finely dusted with white, basal area paler; lines whitish, black margined in median area; first line oblique, straight, second line oblique, slightly sinuous on the folds."

By comparison with specimens sent me I am able to make this reference; my brief description was from the ♀ only. Both this and the preceding species vary considerably in depth of coloring and

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distinctness of lines, and I have very little doubt they are one and the same species. I hesitate, however, to unite them till I have seen more material.

3. **M. atrella** n. sp.—Expands 30 mm. Labial palpi short, the end member very short, all black and covered with long fine outspreading black hairs, annulated with fuscous; front black, with long spreading hairs: thorax black; abdomen dark gray, heavily overlaid with black scales; fore wings narrow at base, apex rounded, outer angle quite distinct, dark gray, overlaid with squamose black scales, the veins outwardly jet-black; lines nearly, or quite obsolete; legs with the femora and tibiæ with long, loose, black hairs. Hind wings blackish gray.

Specimens received from Mr. T. D. A. Cockerell, West Cliff, Col. Differs from all others of our Phycitids in the long spreading hairs of palpi, head, thorax and legs. But as Mr. Ragonot's description of the male of *excantalis* does not speak of this peculiarity it may be this is a very dark form of that species. The females very much resemble that species; are black with white cross lines, but have no brown tinting.

LIPOGRAPHIS Rag.

(Type *fenestrella* Pack.)

Labial palpi thick, broad, horizontal, rounded above on second member, scaly beneath, third member reflexed; maxillary palpi very small; tongue rather strong; ocelli present; antennæ thick, bent above base, a tuft of scales in bend. Legs: tarsi all spinulated. Venation: fore wings 11 veins, 4 and 5 separate, but close; 10 separate; hind wings 8 veins, 2 distant from angle, 3 appearing stemmed with 4 and 5, these stemmed; cell rather short.

Synopsis of Species.

1. Fore wings more or less ochreous or reddish.....2.
   " without ochreous reddish.....**humilis.**
2. " base ochreous reddish; broad reddish outer band...**leoninella.**
   " base not ochreous reddish.....**fenestrella.**

1. **L. fenestrella** Packard, Ann. N. Y. Lyc. Nat. Hist. x. 259, 1873 (*Pempelia*); Grote, Bull. U. S. Geol. Surv. Terr. iv, 697, 1878 (*Nephopteryx*).—Expands 22—24 mm. Body and wings cinereous or granite gray, the abdomen and legs being paler and concolorous with the legs and hind wings, which are of the glistening hue of the family. Fore wings of the same ash hue as the thorax, speckled with black scales. Two black dots at the base of the wing below the median vein. Beyond on the submedian vein is a longitudinal, blackish, inconspicuous stripe, edged on each side with dull ochreous; above it is a dark point on the median and subcostal veins, with whitish scales surrounding the middle dot:

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just beyond the middle of the wing are two prominent, squarish, black spots, one on the median, the other on the subcostal vein. A distinct white submarginal line parallel with the outer edge and bordered internally with black scales, especially marked on the costa; the space between this line and the outer edge is filled in with deep ochreous longitudinal bars, alternating with black streaks, of which the costal one is the widest and shortest; these bars do not quite reach the distinct black line at the edge. Fringe ash, twice lineated with whitish; beneath a pale, whitish, straight, submarginal line, edged within towards the costa with dark ash.

Var. **leoninella** Packard, Ann. N. Y. Lyc. N. H. x, 259, 1873 (*Pempelia*); Grote, Bull U. S. Geol. Surv. Terr. iv, 697, 1878 (*Nephopteryx*).—Expands 23—25 mm. Antennæ and palpi as in *fenestrella*, but the fore wings are more produced towards the apex the outer edge being more oblique. Body and base of the fore wings tawny, the thorax being clay yellow; palpi clear ash; basal third of the fore wings tawny yellow, somewhat orange colored externally, outer edge of this colored portion directed regularly and obliquely outwards from the costa to the inner edge with three black venular dots along this oblique border. In the ash space beyond is a distinct dark discal dot, and the veins are black. A broad marginal, tawny yellow band, the sides even and parallel; the costa, however, is cinereous to the apex. A marginal black line and a fine dark line in the cinereous fringe near the base. Hind wings of the usual hue. Abdomen luteous; beneath fore wings smoky, dusky towards the costa; a pale costal streak not forming a submarginal pale line as in *fenestrella*. Legs dark ashen, whitish at end of joints.

California.

Mr. Grote tells us: "I have examined the type (in poor condition) and three unset, but fresh specimens. The discal points are present, not absent, as Dr. Packard states. This species agrees closely in form with *fenestrella*, but differs by the ochery color of the basal and marginal fields of the primaries."

I, too, have examined the types of both species, and from these and other specimens that have come under my observation, have no doubt of the specific identity of the two forms. *Leoninella* is not even a well marked variety; yet I allow it to stand as a variety, with the statement of my opinion, till larger opportunities for comparison are found.

2. **L. humilis** Rag., Diag. N. A. Phyc. p 11. 1887.—Expands 21 mm. Fore wings short, hind margin not very oblique, brownish gray, finely dusted with whitish, the veins streaked with black, interrupted by the whitish cross lines. Discal spots distinct, very like *fenestrella*, but wings shorter, darker, without any traces of ochreous; the palpi also seem shorter and thicker.

California.

I have not seen this species. If the structural difference holds it is of course a good species, but no reliance can be placed upon the absence of ochreous from the fore wings.

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HYPOCHALCIA Hüb.

(Type *ahenella* S. V.)

Verh. p. 367, 1816; Zeller, 1848, p. 585; Herrich-Schaeffer, Sys. Bear. iv, 85, 1849; von Heinemann, Pyr. p. 165, 1865; Rag., Ento. Mon. Mag. xxii, 18, 1885.

Labial palpi long, horizontal, heavy, second member about two and a half times third; maxillary palpi scale tufted, distinct; tongue rather short and weak; ocelli present; antennæ bent, members in bend toothed. Tarsi spinulated. Genitalia of ♂: uncus broad, triangular, spine not long, hook short; harpe bilobed, the lower part narrow, elongated with stiff inturned hairs; lower plate truncate spatulate, with stiff inturned hairs. Venation: fore wings 11 veins, 4 and 5 separate, 10 separate; hind wings 8 veins, 2 near angle, 4 and 5 long stemmed, 3 separate, 6 stemmed with 7, 7 and 8 stemmed or separate.

1. **H. hulstiella** Rag., Diag. N. A. Phyc. p. 11, 1887.—Expands 22 mm. Fore wings dark reddish brown chocolate color; cross lines broad, ill-defined, formed of dull reddish ochreous gray scales; the first oblique, straight; second line rounded externally, nearing the first line on inner margin. Disc and costa dusted with similar colored scales. Fringe lustrous, dark. Hind wings dark brown.

Texas.

SARATA Rag.

(Type *perfuscalis* Hulst)

Rag., Diag. N. A. Phyc.

Palpi long, drooping, slender; maxillary palpi small; tongue long and strong; ocelli present; antennæ thin, bent and swollen above base, with a very small ridge of scales in bend. Venation: fore wings 11 veins, 4 and 5 separate, 10 separate; hind wings 2 quite far from angle, 3 at angle close to 4, 4 and 5 long stemmed, cell rather short, ♀ smaller than ♂.

1. **S. perfuscalis** Hulst, Trans. Am. Ento. Soc. xiii, 161, 1886 (*Nephopteryx*); Ento. Am. v, 156, 1889.

dophnerella Rag., Diag. N. A. Phyc. p. 11, 1887.

Expands 26 mm. Palpi and head dark fuscous; thorax above nearly black. Abdomen fuscous, with first segment black and second black above; fore wings blackish fuscous, with an ochreous shade medially on costa; two white cross lines rather broad, the first beginning below subcostal space going obliquely to inner margin, the outer near margin and parallel with it; discal space incompletely annulated with white; hind wings dark fuscous; all fringes white, fuscous at base; beneath even, light fuscous, a little lighter on outer field.

This, my description, was of the ♀ only. Mr. Ragonot's description, which includes the male, is as follows:

"Expands ♂ 32 mm ♀ 20 mm. Male fore wings gray, strongly and evenly dusted with black, veins streaked with black, interrupted by the gray, indistinct

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cross lines; the first nearly straight, the second oblique, hardly indented on the folds. Discal and marginal spots rather indistinct. The female shorter, more robust, gray, the basal area black; lines whitish black margined, distinct."

I have a ♂ from Colorado which differs quite considerably from this one of Mr. Ragonot; the cross lines are obsolete, as are the discal spots, and the color is nearly uniform gray with the veins blackish. Taken by Mr. Foster in April.

2. **S. nigrifasciella** Rag., Diag. N. A. Phyc. p. 11, 1887.—♂ 28 mm. ♀ 20 mm. Fore wings of ♂ gray, suffused with dull reddish, basal area whiter. Lines slightly oblique, nearly straight, gray, distinctly black margined in median area; lower discal spot distinct, in a whitish streak. The ♀ pure white, evenly speckled with black; lines white, black margined in median area, fringes blackish; base black.

No locality is given.

ETIELLA Zell.

(Type *zinckenella* Zell.)

Isis 1839, p. 179; 1846, p. 733; von Heinemann, Pyr. p. 154, 1865; Meyrick, Proc. Linn. Soc. N. S. W. iii, 203, 1878; vii, 156, 1882.

Ramphodes Guen., Ann. Soc. Ento. France, 1845, p. 319 (Index Meth. p. 81); Zeller, Chilo. Cram. Phyc. Hor. Soc. Ento. Ross. xvi, p. 177.

Mella Walk., C. B. M. pt. 19, p. 1017, 1859.

Labial palpi long, horizontal, second member very long, five times end member; maxillary palpi long, pencil-tufted; tongue quite long, rather weak; ocelli present; antennæ: basal member with a protuberance within at summit; a bend above base, in one convex reach outwardly, and two equal concave reaches within, with tuft in each concavity, the tuft below of scales turned up, the one above of hair turned down; beyond bend dentate pubescent. All tarsi spinulated, spurs long; thorax with a tuft of long hairs beneath on either side the front. Genitalia ♂: uncus single, spine short; harpæ transposed into long, slender, incurved spines, with a stout incurved spine within at base of each of these; lower plate broad, conical. Wings long, narrow. Venation: fore wings 11 veins; 4 and 5 separate, 10 separate; hind wings 8 veins, 2 quite distant from angle, 3 separate, 4 and 5 stemmed or separate, 6 and 7 stemmed; fore wings with basal scale ridge above.

Synopsis of Species.

Ground color ochreous, powdered with black; no discal spots...**zinckenella.**
" gray, not powdered with black; discal spot present..**shisticolor.**
Base and inner margin reddish.....**rubribasella** n. sp.

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1. **E. zinckenella** Treit., Schm. Eur. ix, pt. 1, p. 201, 1832 (*Phycis*); Zell., Isis 1846, p. 755, 1848, p. 882 (*Etiella*); Hor. Soc. Ento. Ross. xvi, 177; von Heinemann, Pyr. p. 154, 1865; Herrich-Schaeffer, Sys. Bear. iv, p. 72, 1849; Milliere, Ann. Soc. Linn. Lyon, viii, 231; Frei., Lep. Sch. p. 274; Christoph, Horæ Ento. Soc. Ross. xii, 221, 1876.

etiella Tr. x, pt. 3, p. 174, 1835.

dymnusalis Wlk., C. B. M. pt. 19, p. 1017, 1859.

colonnellus Costa Faun. Nap. N. 15, pl. viii, fig. 2 (*Chilo*).

majorellus Costa Faun. Nap. N. 9, pl. viii, fig. 1 (*Chilo*).

Labial palpi dark fuscous; thorax brownish fuscous; abdomen fuscous; fore wings fuscous gray, powdered over with blackish, a white stripe reaching from base to apex, edged on the outer half in front with mouse brown; a basal cross line straight, red, edged inwardly with blackish and outwardly with ochreous reddish; outer line indicated by black lengthened points on veins. Hind wings fuscous, veins and margin darker.

Florida, North Carolina, South Carolina, Texas. Also West Indies; South America; Europe; West Africa; Madagascar; Central Asia.

Milliere (Ann. Soc. Linn. Lyon viii, 231) says that this insect in the larval stage lives on *Coluta arborescens*.

Zeller refers *Mella dymnusalis* Walk., as a synonym of this species.

2. **E. shisticolor** Zell., Hor. Ento. Soc. Ross. xvi, p. 178.

villosella Hulst, Ento. Am. iii, 133, 1887.

Expands 24—27 mm. Labial palpi russet-gray above, gray below. Maxillary palpi yellowish, brown on end. Head, collar and fore thorax orange fuscous. Thorax behind fuscous gray. Abdomen fuscous; fore wings mouse color, consisting of bluish gray, overlaid partly with fuscous. A broad white stripe extending from base along costa to apex. Extreme edge of costa of ground color broadening outwardly just beyond middle and fading away towards apex. A dull yellowish basal stripe reaching from white costal stripe to inner margin, edged inwardly with a row of maroon-brown scales, the scales being longer than usual. Hind wings fuscous, deepening outwardly, with dark marginal line. Beneath even glistening, very light fuscous.

Colorado, California.

Mr. Ragonot has determined *villosella* to be *shisticolor* Zeller, described by him in a Russian periodical. It is very close to *zinckenella*. Zeller's types came from California, and were taken on October 8th.

3. **E. rubribasella** n. sp.—Expands 22 mm. Close to *zinckenella*, of which it may be a variety. Head and thorax reddish brown; abdomen reddish ochreous basally, ochreous anally; wings shorter, apex more sharply angled and anal angle less rounded than in *zinckenella*. Fore wings with edge of costa reddish, followed by a broad cream-white stripe reaching to and including apex, the rest of the wing seal gray, slightly lighter in middle field and darker along costal stripe; cross line broad ochreous, raised scales reddish with metallic golden outer

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edging, the whole with a fused appearance. Base of the wing deep red at middle; wing washed with deep reddish on posterior portion of outer middle field. Hind wings fuscous, light at base, very dark outwardly. Beneath dark fuscous.

Florida. Taken early in May.

MELITARA Walk.

(Type *prodenialis* Wlk.)

Walk., C. B. M. pt. 27, p. 136, 1863.
Megaphycis Grt., Can. Ento. xiv, 29, 1882.

Labial palpi horizontal, or slightly ascending, short, all members heavily scaled, those of the first and second hanging downward, often in heavy tufts; maxillary palpi very small; front shaggy with longish scales; tongue comparatively weak and short; antennæ long, three-fourths of costa, quite heavily bipectinate in both sexes, without bend or tuft; thorax subquadrate, short, heavily and loosely scaled. Abdomen heavy, somewhat flattened above; fore wings subtriangular, costa straight or somewhat concave; hind wings broad, long. Genitalia of ♂: uncus stout, spine short; harpe plain, broad; lower plate long, spatulate, somewhat curved up, very heavily clothed at end with stiff inturned hairs. Legs short, heavy, very heavily and loosely scaled; tarsi spinulated. Venation: fore wings 11 veins, 4 and 5 stemmed, 10 separate; hind wings 7 veins, 2 near angle, 3 and 4 short stemmed, 5 wanting, 6 short stemmed with 7; cell short.

Synopsis of Species.

First line slightly dentate ..... **prodenialis.**
" with very deep angle ..... **dentata.**
" nearly obsolete ..... **fernaldialis.**

1. **M. prodenialis** Walk., C. B. M. pt. 27, p. 137, 1863.
bollii Zell., Verh. Zool.-Bot. Ges., Wien, 1872, p. 550 (Beit. i, 104), pl. iii. fig. 21; 1875, p. 130 (Beit. iii, 130); Grote, Can. Ento. xiv, 29, 1882; Snellen, Tids. Ento. xxx, 64, pl. v. fig. 64, pl. v, figs. 6, 6a.

Labial palpi dark fuscous, sprinkled with black; head, antennæ and thorax even dark fuscous; abdomen ocher fuscous, lightest on posterior segments. Fore wings fuscous at base, half along inner margin, and on outer field, except towards apex, the rest light gray; the whole wing much sprinkled with black and marked with black on veins, as well as with intermediate black striæ; inner line indistinct, waved; outer line more distinct, finely dentate, somewhat sinuous, edged within with blackish. Hind wings pellucid whitish to fuscous. Discal spots coalesced into a heavy black dash.

Texas. Dr. Snellen has received it from Curacao, West Indies.
Larva a borer in Yucca and Agave.

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2. **M. dentata** Grt., Can. Ento. viii, 158, 1876 (*Zophodia*); xiv, 29, 1882 (*Megaphycis*).—Very much like *prodenialis;* ground color very much lighter, being whitish or very light gray. Distinguished from the other species in that the basal line makes a longer outward dentation at middle. The outer line also has the detations much stronger. The inner shade line is more distinct, and there is a row of marginal black points.

Colorado. Taken by Mr. William Foster in June and August. Lives in Yucca; Mr. Bruce raised the larva, but I have not the description.

3. **M. fernaldialis** Hulst, Trans. Am. Ent. Soc. xiii, 163, 1886 (*Megaphycis*). —Expands 50 mm. Palpi, head, thorax and fore wings cinereous; the thorax and wings a little the darker, the palpi being almost white at end. Fore wings with a fine black basal line on post-discal vein, running half way out the wing; beyond disc, veins 4 and 5 finely lined with black to margin; a marginal line of black spots; hind wings pellucid fuscous, iridescent, nearly transparent, white basally; marginal line dark fuscous, hairs long, anal margin forming a fuscous band; fringe of fore wings cinereous, of hind wings white, fuscous at base; beneath even glistening fuscous on fore wings; hind wings as above. Body and legs cinereous, the latter stout and long.

Arizona.

ZOPHODIA Hüb.

(Type *convolutella* Hüb.)

Verh. p. 370, 1816; Zeller, Isis 1839, p. 176; 1848, p. 679; Herrich-Schaeffer. Sys. Bear. iv, p. 90, 1849; von Heinemann, Pyr. p. 189, 1865; Meyrick, Trans. Linn. Soc. N. S. W. vii, 156, 1882; Ragonot, Ento. Mag. xxii, 19, 1885.

Dakruma Grote, Bull. Geol. Surv. Terr. iv, 702, 1878. N. A. Ento. i, 11, 1879; Papilio i, 152, 1882; Riley, Papilio i, 108.

Labial palpi nearly horizontal, rather heavily scaled generally, second member somewhat tufted in front, twice the end member; maxillary palpi distinct, scaled on end into a sort of tuft; tongue quite strong; ocelli present; antennæ simple in ♂; tarsi spinulated, hardly so on fore legs, hind tibiæ swollen. Genitalia of ♂: uncus bent at base, spine rather long; harpe rather light, with quite long spine at base within; lower plate spatulate, heavily edged at end with stiff bristles. All very much like typical genitalia of the Epipaschiidæ. Venation: fore wings 11 veins, 4 and 5 long stemmed, 10 short stemmed or separate; hind wings 7 veins, 2 distant from angle, 3 and 4 stemmed, sometimes separate; 7 and 8 stemmed.

I cannot see how *Dakruma* can be otherwise than a synonym of *Zophodia*, as the types are very closely related, though undoubtedly distinct species.

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Synopsis of Species.

1. Fore wings whitish along costa.....2.
   " gray, costa concolorous .....**grossulariæ.**
2. " whitish.....**glaucatella.**
   " posterior part washed with blackish or fuscous.....3.
3. Inner margin with more or less reddish.....**dilatifasciella.**
   Wings not at all reddish.....4.
4. Costal stripe narrow.....**packardella.**
   " half wing.....**graciella.**

1. **Z. grossulariæ** Pack. Guide (pt. 6), p. 331, as early as March, 1869 (*Pempelia*); Riley, Missouri Rep. i. March, 1869 (*Pempelia*); Papilio i, 108; French, Ills. Rep. vii. 251, 1877; Grote, N. A. Ent. i, 11, pl. 2, fig. 12; i, 68; Papilio i, 142.
turbatella Grt., Bull. U. S. Geol. Surv. Terr. iv, 702, 703, 1878.

Expands 22—25 mm. Labial palpi, head, antennæ and thorax fuscous gray; fore wings very light gray, overlaid with fuscous and blackish; basal field rather darker in middle; basal line near base whitish, rounded outwardly, followed by a broad, even, rounded, blackish band; middle field with blackish running somewhat in longitudinal striæ, with two parallel, somewhat coalescing white stripes just anterior to middle; discal spot fuscous, diffuse, dentated; outer line white, dentate, rather oblique, distinct, margined within with blackish, more marked costally, and lined outwardly with blackish, which extends over the outer field; marginal points black. Hind wings light fuscous, pellucid.

Maine, Massachusetts, New York, Illinois, Missouri, and probably generally East of the Mississippi and Missouri Rivers.

Prof. Riley says the larva is about 16—17 mm. long; head, cervical and anal shields yellowish, mouth parts darker; the body cylindrical, tapering slightly both ways from the middle, of a glass-green color without darker spots; thoracic legs dark; abdominal the color of the body. Food, gooseberries; the larva lives within these, causing them to ripen prematurely.

The pupa is about 7—8 mm. long, dark mahogany in color.

2. **Z. graciella** Hulst, Ento. Am. iii, 134, 1887 (*Spermatophthora*).
longipennella Hulst, Ento. Am. iv, 117, 1888.

Expands 28 mm. Palpi fuscous gray, whitish above. Head light gray. Thorax light fuscous in front, gray at middle, blackish behind. Abdomen gray. Fore wings white on anterior half, fuscous white on posterior half. Veins sharply lined with black or fuscous black, and a blackish line dividing the discal cell. Cross lines faintly indicated, the basal by a black line close to the base and present only near costa, the outer by a black patch near apex. A marginal line of somewhat lengthened black points. Hind wing light shining fuscous. Beneath fuscous, the posterior portion of fore wings and the whole hind wings light fuscous.

Texas. Taken in June and July.

3. **Z. packardella** Rag., Diag. N. A. Phyc. p. 12, 1887.—Expands 16—26 mm. Fore wings much rounded on costa, pale brownish black, very finely and

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indistinctly dusted with white, with very shadowy dark fasciæ; the costa white to the second line, and to the end of the cell, which is followed by a large shadowy blackish round spot; the veins marked as fuscous lines on the white part. Hind wings fuscous.

California.

4. **Z. glaucatella** Hulst, Ento. Am. iv, 117, 1888 (*Honora*).—Expands 22 mm. Palpi, head and thorax light gray, stained with fuscous; abdomen ochreous gray; fore wings white along costal half and base, stained with fuscous on posterior half of middle and outer fields; basal line rounded, indistinct, edged outwardly with black, broad and heavy in middle, obsolete at both ends; discal spot black, prominent; outer line oblique, wavy, edged both sides with dark fuscous, outwardly becoming black at costa; hind wings faded white, pellucid, yellowish outwardly.

Texas. Taken in May.

5. **Z. dilatifasciella** Rag., Diag. N. A. Phyc. p. 13, 1887.—Expands 17 mm. Fore wings white, sparingly dusted with black on the costal half, washed and dusted with reddish gray towards inner margin. Lines white, distinctly black edged, the outer border of first line forming a broad band, wide on inner margin, narrow on costa. Second line sinuous, discal dots distinct.

Arizona; Sonora, Mex.

EUZOPHERA Zeller.

(Type *cinerosella* Zell.)

Stett. Ento. Zeit. xxviii, 377, 1867: Ragonot, Ento. Mon. Mag. xxii, 30, 1885; Meyrick, Proc. Linn. Soc. N. S. W. iv, 239, 1879; vii, 156, 1872.

Stenoptycha, von Heinemann, Pyr. p. 190, 1865.

Melia, von Heinemann, Pyr. p. 209, 1865.

Labial palpi ascending, slender, end member one-half middle; the end member is slightly indented at end with a groove reaching downward, not very distinct; maxillary palpi distinct, a little scale tufted on end; tongue weak, not long; ocelli present, very small; antennæ simple, or hardly bent above base; legs slender; fore legs, tarsi scarcely spinulated. Venation: fore wings 11 veins, 4 and 5 stemmed, 10 separate; hind wings 2 distant from angle, 3 and 4 very short stemmed, rarely separate, 7 and 8 long stemmed.

The tendency in the end member of palpi to a furcation is aberrant, and is the only point in the Phycitidæ which seems to suggest an affinity to the Galleriidæ.

Synopsis of Species.

1. Fore wings washed with deep reddish; middle field not darker than the others. **ostricolorella** n. sp.
   " tinged with reddish; middle field much darker.....2.

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2. Lines sinuous.....**ochrifrontella.**
" angled.....3.
3. First line angled at middle.....4
" not angled at middle.....**aglæella.**
4. Fore wings faintly reddish.....**semifuneralis.**
" blackish gray.....**nigricantella.**

1. **E. ostricolorella** n. sp.--Palpi and head very dark fuscous; thorax fuscous, darker and reddish in front, somewhat ochreous behind; abdomen ochreous; fore wings long, rounded on costa, dark red all over except near apex, and along outer margins, which are ochreous: lines distinct, the basal near the middle of the wing, rather wide, even, angulate near inner margin: outer line distinct, ochreous, angulate outwardly at middle; base and middle field slightly ochreous, discal spots coalescing, very faint. Hind wings shining yellow fuscous.

New York.

2. **E. semifuneralis** Walk., C. B. M. pt. 27, p. 57, 1863 (*Nephopteryx*).

impletella Zell., Hor. Ento. Soc. Ross. xvi, 234, pl. xii, fig. 37 (Chilo Cram. Phyc. Columb.).

pallulella Hulst, Ento. Am. iii, 137.

Expands 18—25 mm. Tongue light gray. Palpi fuscous. Head and thorax dark olive fuscous. Abdomen ocher fuscous; fore wings light gray, with reddish brown and black markings. Basal field reddish brown, except along costa, deepest along the basal line. Basal line white, far out at the middle of the wing, twice angled inwardly, scalloped outwardly. Middle field narrow, bright black, with more or less of white scales, except along inner margin, which is reddish brown. A white discal point; outer line distinct, white dentate sinuate, with two angles more or less rounded inwardly, edged within with a sharp black line: outer field reddish brown, except apically, which is light gray. A marginal black line cut by the veins. Hind wings smoky fuscous, with black marginal line. Beneath fuscous, fore wings lighter on outer field, and hind wings with outer line faintly indicated.

New York, North Carolina, Utah, Washington, Texas, Illinois, Colorado, Florida. I have received specimens taken in March, April, September and October, from Texas.

The species varies considerably in coloration and distance apart of the cross lines. Some specimens approach *aglæella* very closely, and others *nigricantella*. I have little doubt the three forms overlap each other.

I have received from Prof. S. A. Forbes, Champaign, Ill., a detailed description of this insect published in a local paper in anticipation of its proper publication in his 16th Report. By his permission I am able to give a full account of the larva and its methods of pursuing its work, with other interesting notes on the life history of the insect.

LARVA.—The general appearance of this larva is that of a dusky, somewhat hairy caterpillar, paler beneath, with reddish brown head, darker in the middle

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and variegated cervical shield. Principal hairs conspicuously long and slender. The head is brown, with a lateral black blotch behind the eyes, smooth, much darker on the slightly depressed frontal area, this bordered by depressed black sutures, outside which, at a little distance, is a V-shaped fine white line. Antennæ 3-jointed; first joint very large, broadly conical; second, thick, oval, with a very long stout hair at outer side of tip; the third minute. Ocelli five, black, placed behind the antennæ, in a curve opening downward. Labrum broadly emarginate, with rounded lobes. Maxillæ and labrum pale beneath, with dark sutures, strongly contrasting with adjacent parts of head. Mala and palpi brown. Labial palpi minute. Maxillary palpi 3-jointed, large; first joint nearly as thick as the palpiger, and about as broad as long; second joint cylindrical, width two-thirds the length; third joint tapering, about two-thirds as long as the second. Body with six conspicuous rows of long, pale hairs, longest on the posterior segments, one hair of each row to each segment, each borne on a minute black piliferous tubercle, scarcely as large as the spiracle. One row above spiracles, another equally distant below, and two subdorsal rows. Other smaller hairs irregularly distributed. Cervical shield yellow, smooth, with a few scattered hairs and two curved brown blotches, one on each side, separated by a median spot. Anal plate coriaceous, brown, heart-shaped, with six long, stout hairs at its posterior margin. Posterior segments without spines or tubercles at hind margin, differing here from the peach borer. Spiracles black, nearly circular, anterior pair but little larger than the remaining eight, last pair not exceeding the eighth in size. Thoracic legs pale reddish brown externally, paler within, with dusky tips. Each proleg, except the last pair, with a complete close circlet of large hooks, and several smaller ones besides, and also a horny black central disk or tubercle within the ring. Last pair with a single half circlet of very strong, close-set hooks.

This is becoming a pest in Illinois, attacking and destroying Plum trees. The larvæ are generally found near the forks of the trees, but often at or a little beneath the ground. The smaller ones live in the bark, often just below the outer skin; later they cut through the whole bark often destroying trees. Kept in a breeding-cage and supplied with twigs of Plum trees they, in the Autumn, spin small webs, in which they pass the winter, pupating the next Spring and emerging near the end of May.

Other moths of this species were taken several times at the electric light in 1886, 1887 and 1888, the dates of their occurrence ranging from May 5th to August 24th. The greater part, however, were collected in May and June, and this is doubtless the period of the greatest prevalence of the winged form. The time and place of oviposition are unknown.

In brief, the species is apparently single-brooded; passes the Winter as a larva in the tree; pupates in May; emerges in May and June, and may continue to lay eggs through July and August.

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3. **E. nigricautella** Rag., Diag. N. A. Phyc. p. 14, 1887.—Expands 22—26 mm. Fore wings gray, very strongly and evenly dusted with black; lines hardly paler, black margined in median area, approximate, remote from base; first line with a deep sinus in the middle outwardly, and an angle on dorsal vein; second line angled in the middle, indented on the folds. A white spot on the disc. Hind wings yellowish white, veins fuscous.

Arizona; Sonora, Mex.

4. **E. aglæella** Rag., Diag. N. A. Phyc. p. 14, 1887.—Hulst, Ento. Am. v, 155, 1889.—Expands 20 mm. Fore wings elongate, pale gray, washed with pale reddish brown, except on the costa; lines approximate, whitish, black margined in median area; first line very remote from base, perpendicular, but forming an angle inwards on dorsal vein, second line obtusely angled in the middle. Median area much dusted with black; an elongate spot on disc. Hind wings whitish.

Utah; Sonora, Mex.

5. **E. ochrifrontella** Zell., Verh. Zool.-Bot. Ges., Wien, 1875, p. 337 (Beit. iii, 131), (*Ephestia*).

ferruginella Rag., Diag. N. A. Phyc. p. 14, 1887.

Expands 10—12 mm. Head ocher yellow, thorax ocher fuscous, reddish. Abdomen ocher gray; fore wings dark brownish red, lines slightly sinuous, very approximate, remote from base, pale ochreous, so broadly black margined in median area that this appears quite black; a whitish spot on disc. Hind wings fuscous, darker on margin.

Massachusetts, North Carolina, Illinois, Texas, Ohio.

Prof. Forbes took the insect at "sugar" at Urbana, Ohio, August 3d and in September. This insect is also somewhat variable in appearance. A specimen identified by Mr. Ragonot as *ferruginella*, corresponds with Zeller's type of *ochrifrontella* in the Cambridge Museum.

6. **E. franconiella** n. sp.—Expands 28 mm. Labial palpi dark fuscous; front gray, darkened with fuscous in middle; thorax dark fuscous; abdomen fuscous gray; fore wings dark fuscous, lightened with light gray on costal half within outer line; a distinct central longitudinal black dash at base reaching to first line; first line white, indistinct, broken, diffuse; outer line indistinct, white, oblique, starting just within apex, with a sharp zigzag at middle; discal spots distinct, coalesced, somewhat diffuse; outer field fuscous. Veins lined with black, this color showing sharply on the gray anterior portion; a black line also crossing the cell longitudinally in middle field. Hind wings fuscous gray, veins and margin darker.

Franconia, N. H. Taken by Mrs. A. T. Slosson, of New York. Very like *Zophodia graciella* in appearance.

SENECA* n. gen.

(Type *tumidulella* Rag.)

I am unable to give a full description of this genus, as I have

* An ancient tribe of Indians of Central New York.

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never seen the species which is its type. Mr. Ragonot describes and catalogues it under *Cateremna* Meyrick. That genus was based on Australian species, which I have not seen. Mr. Meyrick says, and Mr. Ragonot agrees that the European *tenebrella* is a *Cateremna*. Taking this as a guide, in general structure, Seneca has erect, recurved labial palpi; maxillary palpi short, filiform. Antennæ simple, tongue long, ocelli wanting in *tenebrella*. Venation: fore wings 11 veins, 4 and 5 separate, 10 separate; hind wings 7 veins, 2 distant from angle, 3 and 4 stemmed, 5 wanting, 6 and 7 stemmed, 7 and 8 stemmed. The new genus differs in having a basal ridge of scales on fore wings above. No note is made by Mr. Meyrick nor Mr. Ragonot of the ocelli; the probabilities are they are present in *tumidulella*, though they are wanting in *Cateremna tenebrella*. Whether the Australian species have these organs I do not know, but the basal scale ridge is a sufficient generic character, and common to both sexes.

1. **S. tumidulella** Rag., Diag. N. A. Phyc. p. 13, 1887 (*Cateremna*).—Expands 20 mm. Fore wings blackish gray: costa with a whitish patch in median area extending to the distinct discal dots, leaving a black triangular patch after the first line. First line oblique, gray, preceded by a perpendicular ridge of black raised scales, the triangular space between dark reddish brown; second line sinuous, gray, dark margined; marginal dots distinct.

Florida.

VITULA Rag.

(Type *edmandsii* Pack.)

Rag., Diag. N. A. Phyc. p. 14, 1887.

Labial palpi ascending, filiform, end member nearly as long as middle; maxillary palpi distinct; ocelli wanting, tongue strong, antennæ of ♂ pubescent, slightly bent above base, without tuft; fore wings with tuft of scales on costa below near base. Genitalia of ♂: uncus short, base broad, harpe light, broad; lower plate conical, curved up on both sides, armed with bristles; last segment beneath with four tufts of hairs, these resting upon a somewhat chitinized surface, with a heavy chitinized bar on each side. Venation: fore wings 11 veins, 4 and 5 stemmed, 10 separate; hind wings 7 veins, 2 distant from angle, 3 and 4 separate or very short stemmed, 8 very short.

1. **V. edmandsii** Pack., Proc. Essex Inst. iv, 120, 1864 (*Nephopteryx*); Guide, p. 331, p. iii, fig. 2, 1870; Hulst, Ento. Am. v, 156, 1889.
dentosella Rag., Diag. N. A. Phyc. p. 14, 1887.

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Expands 17—20 mm. Fore wings gray, dusted with black, especially in the median area, sometimes washed with reddish; lines pale, black margined in median area, rather approximate, both parallel with hind margin; first line produced on dorsal vein into a strong angle; second line sinuous, produced into a distinct angle on median vein. Discal dots forming a streak. Hind wings whitish. Larva, according to Packard, lives in the nests of bumble-bees and feeds on the cells.

Canada, New York, North Carolina, Florida, Texas.

I have referred *dentosella* Rag. as a synonym of *edmandsii* Pack. on the authority of a specimen received from Mr. Ragonot labeled *Vitula dentosella* Rag., which is the same as Packard's type of *edmandsii* in the Cambridge Museum.

2. **V. serratilineella** Rag., Diag. N. A. Phyc. p. 15, 1887.—Expands 25 mm. Fore wings unicolorous blackish gray, lines black, very distinct and dentate. The first is slightly curved outwards; the second approximate to the hind margin is acutely angled inwardly on the discal fold and outwardly below. A black lunule on disc; a few black scales at the base. Hind wings pale brownish gray.

No locality given by Mr. Ragonot. I have it from S. California.

3. **V. basimaculella** Rag., Diag. N. A. Phyc. p. 15, 1887.—Expands 16 mm. Fore wings white, speckled with black; below median vein suffused with brownish gray; first line whitish, indistinct, perpendicular, distinguishable by its very broad black external border, which is less distinct on inner margin; second line white, distinctly black margined, oblique, indented on the folds. Discal spots one above the other, distinct. A black spot on the costal vein at base. Hind wings fuscous.

No locality is given by Mr. Ragonot.

CANARSIA* n. gen.
(Type *ulmiarrosorella* Clem.)

Labial palpi erect, recurved, exceeding head, end member one-half middle; maxillary palpi distinct, scaled, but not pencil tufted in ♂; tongue strong, but rather short, about four times head; ocelli present, quite distinct; antennæ of ♂ bent above base, a large tuft of scales in the bend, otherwise crenulate pubescent. Legs light, not long, all tarsi spinulated. Genitalia of ♂: uncus short, bifid, broad at base; harpe broad; lower plate spatulate conical, with inturned hairs; last segment of abdomen below with chitinous plate and two tufts of hairs; between these two chitinized processes with lateral projection half way out, and in front of all these filiform, pennant-like processes four in number; the abdomen of the ♀ on penultimate and

* A tribe of Indians formerly on Long Island, N. Y.

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antepenultimate segments is armed with short spines, about twelve in number. Venation: fore wings 11 veins, 4 and 5 always stemmed, sometimes quite short, 10 separate; hind wings 7 veins, 2 near angle, 3 and 4 always stemmed, 6 and 7 separate, 8 always separate from 7.

This genus is close to *Psorosa* Zell., differing principally in the stemming of 4 and 5 of fore wings, which, after a study of forty or more examples of the type, seems to be entirely constant; it differs also in the armature of the abdomen of ♀ beneath; the tongue is also much shorter.

Synopsis of Species.

Fore wings brownish black; lines broad, even white.....**hammondi.**
" dark gray; lines fine dentate.....**ulmiarrosorella.**

1. **C. ulmiarrosorella** Clem., Proc. Acad. Nat. Sci. Phil. 1860, p. 205 (*Nephopteryx*); Grote, Bull. Geol Surv. Terr. iv, 1, 1878.
pneumatella Hulst, Ento. Am. iii, 137, October, 1887 (*Stenoptycha*).
ulmella Rag., Diag. N. A. Phyc. p. 13, December, 1887 (*Psorosa*).
fuscatella Hulst, Ento. Am. iv, 118, 1888.

Expands 18 mm. Head blackish gray. Thorax fuscous gray. Abdomen with segments ringed, dark fuscous in front, light fuscous behind. Fore wings blue-gray, quite even in color over the wing. A small white spot at centre of basal field, sometimes obsolete. Basal cross line well out, wavy angulate, shadowed by black outwardly, which is heavier and more diffuse near costa. Two black discal points, generally confluent, often followed by white. Outer line fine, white, angulated from costa first inwardly then outwardly, then nearly straight to inner margin, shadowed inwardly and outwardly with black, the inner line being the heavier. A marginal line of black points. Hind wings smoky to ocher fuscous, subpellucid. Beneath fuscous, the outer line of fore wings evident; hind wings as above.

Food-plant the American Elm. Maine, New York, Pennsylvania, Missouri, Wisconsin, Texas, Illinois, Iowa.

I have no doubt that the above synonymy of this species is correct. Clemens' type is lost, and his description is very brief, but he gives the food-plant, and taking the two points together I think this his insect.

Clemens says of the larva: "the larva is found on the American Elm in August. The head is pale brown, dotted with dark brown. The body dark green, with a dorsal double line of pale green patches and a slight dorsal and stigmatal line of the same hue. On the first, second, fourth, fifth and tenth rings are brown, subdorsal points. It weaves a web on the surface of the leaves, feeding beneath it. The pupa is contained in a web between united leaves in the vivarium. It becomes a pupa about the middle of August, and an imago about

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twelve or fourteen days after transformation." I have taken the insect in Brooklyn in September. I have specimens from Texas, taken in April, May, June and September. In Texas, therefore, it may be, and probably is, two-brooded. Mrs. Fernald took the insect from June 24th to July 23d, at Amherst, Mass. Prof. Forbes writes me he has taken the imago at electric light on July 20th and August 16th, at Champaign, Ill.

2. **C. hammondi** Riley, Mo. Rep. iv, 46, fig. 21, 1872 (*Pempelia*); Index Mo. Rep. p. 80, 1881; Ill. Rep. xv, 252, 1877; Weed, Ill. Rep. xv, p. 58.—Average expanse 12 mm. Fore wings glossy purplish brown, with two silvery gray transverse bands, dividing the wing on costa in about three equal parts; the basal band sharply defined outwardly, and always extending to inner margin, the posterior band never extending more than half way across the wing, and generally not more than one-third, illy-defined. In some specimens the basal band is quite narrow, with the basal shade paler than the median; in others the band forms a double line. In some specimens also a narrow, pale, transverse line outside the second band, and a pale terminal shade are visible. Hind wings uniformly paler gray. Under surface glossy gray with no marks, the front wings a shade darker than the hind.

LARVA.—Length 11—12.5 mm. General color olive or pale green, or brown, with a broad dark stripe along each side of back. Tapers slightly both ways; joints 4—12 inclusive, divided into two transverse folds; freckled with numerous pale specks and with piliferous spots, the specks often taking the form of two pale broken lines along the upper edge of dark stripe. The piliferous spots are pale with a central black dot, and are best seen in dark specimens. On joints 4—12 inclusive, there are placed 4 in a square in the middle of the back, and 4 more each side, the two upper lateral ones being on the anterior fold, the stigmata appearing as minute rufous specks between them. Both these spots are often double. The third lateral spot is on the posterior fold, and the fourth is subventral and anterior. The hairs proceeding from these spots are long and setaceous. Head horizontal, freckled, pale behind, tinged with green in front and with a few long hairs; joint 1 also freckled, and with a large black piliferous tubercle, with a pale basal annulation, and in range with middle of dark stripe; joint 2 with similar black tubercles, with a white center and replacing the uppermost lateral pale spot. There are but two of the small, pale, dorsal, piliferous spots on this joint (between the tubercles), as well as on joint 3. Beneath immaculate, except that the thoracic legs have sometimes a few dusky dots. In very dark specimens the head, cervical shield, and anal plate remain pale. The cervical shield is then well defined, with four piliferous specks at anterior edge, and the large shiny tubercle forms the extreme anterior angle.

PUPA.—Length 6 mm. Rather short and stout, with two diverging spines and a few stiff bristles at tip.

In many specimens the subdorsal dark stripe is obsolete or subobsolete, but even then the four black tubercles on joints 1 and 2 characterize the larva sufficiently (from Riley).

Prof. Forbes took this insect at electric light July 25th.

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LÆTILIA Rag.
(Type *coccidivora* Comst.)

Cat. N. A. Phyc. Ento. Am. p. 116, 1889.

Labial palpi generally somewhat ascending, rarely appearing porrect, end member quite long, one-half middle member; maxillary palpi distinct, not tufted; ocelli present; antennæ simple, not bent above base; tongue weak, rather short. Venation: fore wings 11 veins, 4 and 5 stemmed, 10 separate; hind wings 7 veins, 2 at angle, 3 and 4 short stemmed, 8 very short; cell short, about one-third of wing.

I am not at all certain this genus has a right to exist. It has not been described that I am aware of, but Mr. Ragonot catalogues it with the species *coccidivora* and *ephestiella* under it. There seems to be here what is otherwise unknown to me, a variation in the labial palpi. I have some specimens from Texas where they are erect, and others where they are absolutely horizontal. In every other respect these specimens agree; these are not sexual variations; nor do I feel justified in looking upon the difference as an evidence of two species, for I have intermediate forms. The New Mexico specimens all have porrect palpi.

1. **L. coccidivora** Comstock, N. A. Ento. i, 25, 1879, pl. 4 (*Dakruma, coccidivora*); Rept. U. S. Agric. Dept. 1880; Packard, Ins. Inj. to Shade Trees, p. 54.
pallida Comstock, Dept. Agric. Rept.

Expands 10—18 mm. Head above dark ash-gray, with a faint coppery reflection, below and behind the eyes, white. Eyes black and coarsely faceted; lower surface of the antennæ pale brown, upper surface dark gray, with coppery and green reflection. Labial palpi black, sprinkled with white scales, and with the base almost entirely white. Maxillæ rust-red, with the basal half clothed with white scales, interspersed with a few black ones. Thorax above and patagiæ dark gray, with brown and green reflections. Abdomen annulated with brown predominating above, the light gray beneath. Fore wings light gray, marked with brown and black. A light band extends across the outer part of the basal third of the wing; the costal half of this band is wide, reaching nearly to the base of the wings; the remaining half is narrow. Near the base of the wings there is a short transverse gray band, which is sometimes obsolete; exterior to this is a short longitudinal black spot, which also varies greatly in size and intensity of color. The light band which extends across the outer part of the basal third of the wing is bordered externally by a dark band, which is narrow on the costa and near the middle of the wing, widens so as to reach the outer third of the wing. There are two black discal spots which are sometimes distinct, but more often united, so as to form a single crescent-shaped spot opening outward. A row of six or seven black spots on the outer margin, and one-fourth the distance to the body, a wavy light gray band parallel to the exterior margin, and bordered on each side with dark brown; the costal end of the outer of these

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brown borders is usually darker and widened externally, forming a conspicuous black triangular spot; lower surface of the front wings gray, especially towards the apex, with a slight brassy tinge.

LARVA.—Length of the full grown larva 8—12 mm. Body cylindrical, tapering slightly towards each end. Head small, rounded, slightly bilobed, black, and somewhat polished; antennæ white, 4-jointed, basal joint largest, the second

Lætilia coccidivora Comstock.
(after Comstock)
a, egg; b, larva; c, pupa; d, imago; e, moth at rest.

about one-fourth the length of the first, third nearly as long as the first, but only about one-third as thick, fourth a mere tubercle; upper surface of the body a greenish black color with a faint tinge of bronze; prothoracic shield black, finely granulated, and with a pale dorsal line; anal shield a little darker than the body and sparsely beset with long hairs. Stigmata and all piliferous spots brown, with pale centres; under surface of the body bluish green. Legs black, with the nodes bluish green, the ring of hooklets of prolegs pale brown with a light center.

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EGG.—White, faintly glossy; oval in outline, ½ mm. long, ⅓ mm. wide; surface closely indented with large, irregular, five- or six-sided pits; the walls of the indentations forming sharp ridges over the surface of the egg.

NEWLY HATCHED LARVA.—Length 5 mm. Color dull white, tinged with yellow; head and thoracic shield dark brown; mouth parts dull yellow; body attenuated; head and thoracic plate large, round, flattened dorso-ventrally; head with several long lateral hairs; each abdominal segment furnished laterally with a long stiff hair; thoracic and prolegs strong and well developed.

CHRYSALIS.—Length 6.5 mm. Color: dorsum dark brown, inclining to blackish toward anus, venter a little lighter, wing and antennal sheaths yellowish brown. Wing sheaths reaching nearly to the sixth abdominal segment; antennal sheaths reaching to the tip of the wing sheaths; dorsum densely punctured, venter less so; stigmata at the tips of slight protuberances; tip of abdomen nearly surrounded by a whorl (complete dorsally, incomplete ventrally) of small pointed tubercles.

Prof. Comstock, in addition, gives the following history of this insect: "While studying a colony of the cottony maple scale (*Pulvinaria innumerabilis*) which was found on a branch of *Negundo aceroides* in Washington, I was surprised to find a Pyralid larva living within the cottony mass excreted by these insects. On further examination it was found that very many of the bark lice afforded retreats for similar larvæ. This, with the fact that the eggs deposited by such individuals or the young lice developed from them, had been destroyed, indicated that the Pyralid larvæ were predaceous. One of these larvæ was placed in a glass tube with a bark louse, the eggs of which had not been destroyed. These eggs had just hatched, and the cottony excretion was swarming with the young lice. The larva soon made its way under this mass, and after spinning a delicate silken tube about its body began to devour the young lice greedily.

Although the caterpillar is well protected, living, as it does, within the mass of cottony excretion, it spins about its body a delicate silken tube, which when spun within the cottony mass is with difficulty distinguished from it. When a branch is thickly infested by *Pulvinaria*, these tubes extend from one bark louse to another. The caterpillars are very active, moving about freely within these silken passages from beneath one scale to another.

At the time my observations were made (June 24th) many of the caterpillars were full grown, and some of them transformed at once. The cocoon is made within the silken tunnel and is quite delicate, the pupa being plainly visible within it. Individuals of this brood remained ten days in the pupa state. The greater number bred by me issued July 17th; some, however, did not appear until Aug. 13th.

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These moths are not easily disturbed, but will suffer the twig upon which they are to be handled freely without moving, and often they will not take to flight even when touched. They usually rest upon the two posterior pairs of legs, and the tip of the folded wings with the fore legs drawn closely to the body, and the whole body forming an angle of about 45° with the object upon which they are at rest. In this position they will remain motionless for hours.

Several of the moths were placed in a breeding-cage containing a twig infested with *Pulvinaria*. Several eggs were afterwards found. These were deposited singly either on the bark, the coccid scales, or the cottony masses. Six days after oviposition the eggs hatched. The moth seems to be two brooded."

This is a most remarkable and interesting history, and seems as yet to be unique in the family.

I have received specimens of the insect from Central Texas and New Mexico. The Texas specimens were taken in May, June, August and September. The New Mexico specimens in September.

Pallida is simply a somewhat lighter variation.

2. **L. ephestiella** Rag., Diag. N. A. Phyc. p. 13, 1887 (*Dakruma*).—Expands 17 mm. Fore wings narrow, unicolorous, obscure blackish gray; lines hardly paler, finely edged with black; first line nearly straight, slightly curved outwards; second line parallel with hind margin, sinuous, deeply indented on discal and dorsal folds; a black streak on disc. Hind wings semi-transparent, whitish.

Arizona.

STAUDINGERIA Rag.

(Type *morbosella* Rag.)

Ann. Soc. Ento. France, 1887, p. 249.

Labial palpi ascending, straight, long; maxillary palpi pencil tufted; ocelli present (in American species); antennæ simple, or scarcely bent above base; tongue strong. Genitalia of ♂: uncus stout, at once bifid to broad base, with two processes above terminal spine, one on each furcation; harpe as usual; lower plate broad, truncate conical, curved up on edges, heavily armed on outer edge with bristles; last segment of abdomen, with chitinized cross bar without tufts. Fore wings long, narrow, triangular, angles distinct. Hind wings well rounded, broad. Venation: fore wings 11 veins, 4 and 5 in a line with the median nervure; hind wings 7 veins, 2 at angle or close to it, 8 near 7, but separate.

In the American species (referred to this genus by Mr. Ragonot after a study of the type) 4 and 5 are not on a line with median

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vein; they are very short stemmed, and 10 is separate. In the hind wings 3 and 4 are stemmed one-half length, 7 and 8 are stemmed. The description of the genitalia is from the American species.

1. **S. albipennella** Hulst, Ento. Am. iii, 133, 1887 (*Pempelia*).—Expands 20 mm. Palpi whitish fuscous, darker at end; head ocher fuscous, as also abdomen: thorax fuscous. Fore wings dull ocher clay-white, shaded and washed with fuscous reddish basally and beyond first line, at middle sometimes wanting. Lines intermediate, revealed by the fuscous, the basal with blackish spot along inner margin, the outer close to margin, parallel with it. Hind wings light fuscous, with veins and margin darker.

Southern California.

HETEROGRAPHIS Rag.

(Type *legatella* Hüb.)

Ento. Mon. Mag. xxii, 31, 1885.

Mona Hulst, Ento. Am. iv, 115, 1888.

Labial palpi erect, slightly exceeding head, end member short; maxillary palpi small, filiform; tongue rather long, stout; ocelli present; antennæ simple, slightly bent, pubescent. Legs: tarsi all spinulated. Venation: fore wings 11 veins, 4 and 5 separate, these on a line with the median vein, 10 separate; hind wings 7 veins, 2 at angle; 3 and 4 long stemmed.

1. **H. morrisonella** Rag., Diag. N. A. Phyc. p. 11, 1887 (*Heterographis*). —Expands 14—22 mm. Fore wings clay-white or ochreous, dusted unevenly with blackish, particularly on and about the veins and along the lines. Costa whitish to second line. Lines whitish, oblique, not distinct, the outer near margin and sometimes seeming dentate by the fading of the blackish edging; sometimes a band within basal and beyond outer line, sometimes one, sometimes both wanting. Discal dots distinct or wanting. Hind wings fuscous, pellucid.

Texas, Colorado, New Mexico.

Var. **olbiella** Hulst, Ento. Am. iv, 116, 1887 (*Mona*).

Under this name I described several specimens, part the normal form of *morrisonella*, part what I think to be a variety having the same markings, but washed all over, except on the lines, with deep wine-red; the name may hold as a varietal name for this very distinct form.

Var. **coloradensis** Rag., Diag. N. A. Phyc. p. 12, 1887 (*Heterographis*).

In my specimens I have is every variation from *morrisonella* to *coloradensis*. The latter differs from the type form in having no ochreous submarginal band, or as some specimens are found without the basal band also, it may stand for the form having no orange ochreous on fore wings.

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HONORA Grote.
(Type *mellinella* Grt.)

Bull. U. S. Geol. Surv. iv, 702, 1878; N. A. Ento. i, 11, 1879.

Labial palpi erect, exceeding head, end member quite short; maxillary palpi distinct, scale tufted on end; tongue rather long; ocelli small; antennæ simple, pubescent; legs not heavy, tarsi spinulated, spurs slender, short. Genitalia of ♂ after the normal pattern, without spines; last segment of abdomen beneath with two tufts of hairs. Venation: fore wings 11 veins, 4 and 5 long stemmed, 10 separate; hind wings 7 veins, 2 at angle, 3 and 4 stemmed, 7 and 8 stemmed.

Differs from *Heterographis* Rag. only in the stemming of 4 and 5 of fore wings. I place *undulatella* Clem. under this genus rather than under *Heterographis*, as does Mr. Ragonot, for 4 and 5 are always stemmed, though not always long. If the two genera must be combined by this connecting species, then *Heterographis* becomes a subgenus only. In his description Mr. Grote says the labial palpi are porrect, but afterwards confesses he mistook the meaning of that term, and meant ascending, or recurved. There is very considerable difference in the palpal structure of the species from sharply erect to obliquely ascending; one species has the end member horizontal, the second heavier, ascending.

Synopsis of Species.

1. Fore wings washed more or less with reddish.....2.
   " not washed, or with red spots only.....4.
2. Costa at middle broadly white; basal line not straight.....3.
   " lighter than rest of wing, but not white; basal line straight. **sciurella.**
3. Color deep red; second line close to outer margin.....**subsciurella.**
   " brown-red; second line distant from margin.....**montinatatella.**
4 Fore wings gray or fuscous, with no red spots; costa concolorous..**oblitella.**
   " with red spots; costa narrowly lighter .....5.
5. " brownish; two red spots on either side basal line; outer line indistinct.....**ochrimaculella.**
   " ocherish gray; one red spot at base, another beyond basal line at middle; outer line distinct.....**mellinella.**

1. **H. oblitella** var. **undulatella** Clem., Proc. Acad. N. Sci. Phil. 1860, p. 205 (*Nephopteryx*); Grote, Bull. U. S. Geol. Surv. Terr. iv, 698, 1878; Packard, Ins. injurious to Shade Trees, p. 69, 188.

propriella Walk., C. B. M. pt. 35, p. 1716, 1866 (*Nephopteryx*).

oblitella Rag., Ento. Mon. Mag. xxii, 31, 1885 (*Heterographis*).

Expands 14—16 mm. Palpi whitish to fuscous, fuscous or black at tip; head and thorax fuscous; abdomen gray to blackish. Fore wings dark to light gray, washed with fuscous and dusted more or less with blackish, sometimes without

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red spot within basal line, rarely washed with reddish; lines distinct, brokenly shaded dentate, the basal oblique, the outer parallel with outer margin and near it. Hind wings dark fuscous.

Canada, Massachusetts, New York, Pennsylvania, Illinois, Virginia, Texas, Colorado, Utah, California. From Texas I have received it in August and September.

Mr. Ragonot makes this a synonym of *oblitella* Zell. It seems sufficiently distinct, however, to be called a variety of that species.

Clemens says: "Early in October I found the pupæ of this insect at Niagara Falls, on the Canada side, under shelter of loosened portions of the bark of the American Elm. They were enclosed in a cocoon of silk mixed with particles of bark. On the same tree I took a number of larvæ which were descending the tree to undergo pupation. Head as broad as the body and dark green. Body dark green, between the segments yellowish, and dotted with yellow; first rings with two black dots on the sides."

2. **H. mellinella** Grt., U. S. Bull. U. S. Geol. Surv. Terr. iv, 702, 1878; N. A. Ento. i, 11, pl. ii, fig. 11, 1879.—Expands 15—19 mm. Fore wings blackish fuscous with a pale undefined costal shading; interior line white; a yellow shade spot beyond the line on internal margin; two separate, very small dark discal dots; exterior line near the margin, even, narrow and indistinct white; base of the wing yellowish; anterior line not continued to costa; hind wings very pale fuscous, silky, with concolorous fringes; head and thorax faded ochreous.

Texas.

The above is Mr. Grote's description. Mr. Ragonot, who had seen Mr. Grote's type in the British Museum, sent me under this name an insect which does not accord with Mr. Grote's description. Indeed, the description of Mr. Grote accords exactly with what Mr. Ragonot has sent me as *ochrimaculella* Rag. The insect sent as *mellinella* Grt. has erect, long palpi, ochreous wings, stained and peppered with blackish; lines whitish, the inner indistinct, except near inner margin, edged on inner margin with a spot of reddish, this edged basally with black; outer line distinct, twice dentate, with orange ochreous outer band; there is also more or less of ochreous orange along inner margin. I think *ochrimaculella* must be a synonym of *mellinella*, and that the lighter species must be unnamed, but till further evidence in that direction I must rest upon Mr. Ragonot's determination of my specimens; his *ochrimaculella* has the palpi much less erect, the end member nearly horizontal, the second thickly scaled. This accords also better with Mr. Grote's description, and his idea of what

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"porrect" meant. His description says: "labial palpi not very long, porrect, thickly scaled." By "porrect" he says afterward he did not mean horizontal, but at least ascending (Can. Ent. xiv, 30, 1882).

3. **H. ochrimaculella** Rag., Diag. N. A. Phyc. p. 12, 1887.—Expands 18—24 mm. Fore wings brownish gray, somewhat dusted with white, especially towards the costa, and evenly dusted with black; the base dull ochreous. First line whitish, slightly oblique, followed by a distinct ochreous patch; second line hardly discernible. Discal spots distinct, followed by a whitish cloud; costa arched beyond the middle; hind wings unicolorous, dirty gray.

Texas, New Mexico, California.. Specimens from New Mexico were taken in August and September.

4. **H. sciurella** Rag., Diag. N. A. Phyc. p. 12, 1887.—Expands 32 mm. Fore wings of a paler red than *canicostella* (*montinatella*), with similar markings, but not so distinctly white on costa; the first line is straight on inner margin, distinctly preceded by a black cloud, and is not continued on costa; second line very close to hind margin, oblique, hardly sinuous. Marginal spots distinct.

California.

5. **H. subsciurella** Rag., Diag. N. A. Phyc. p. 12, 1887 (*Honora*).—Expands 22 mm. Fore wings dark red, but very strongly dusted with black on and about the veins, leaving very little of the ground color, except at base; costa white, like in *canicostella*, but dusted with blackish on the veins; first line white, curved inwards, not attaining costa; second line oblique, straight, dentate, white, very close to outer margin. Discal spots distinct, less so than the marginal dots.

Colorado.

6. **H. montinatatella** Hulst, Ento. Am. iii, 134, October, 1887; Ento. Am. v, 156, 1889.

canicostella Rag., Diag. N. A. Phyc. p. 12, December, 1887.

Expands 24—28 mm. Head, thorax and abdomen fuscous, with a tinge of reddish on the patagiæ. Fore wings bright reddish gray, except a broad costal stripe reaching from base nearly to apex, which is white with scattered reddish scales. Very faint indications of basal and outer gray cross lines by a lightening of the red color on the lines, and a deepening of it on either side. Margin and fringe grayish fuscous. Hind wings fuscous, with black marginal line. Beneath dark fuscous, with a reddish tinge on fore wings; fuscous on hind wings.

California, Nevada.

The following is Mr. Ragonot's description:

"Fore wings dark brownish red, slightly rosy, sometimes washed with blackish before the first line, dusted with gray on hind margin, a white streak on costa to second line, expanding to median vein, very obliquely crossed by the first line, which afterwards is white, perpendicular, but sinuous and dentate; second line far removed from hind margin, white and sinuous. Discal spots in a white streak, marginal spots invisible."

I have seen a specimen from Mr. Ragonot which agrees with my type.

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DOLICHORRHINA Rag.

(Type *aureofasciella* Rag.)

Nouv. Gen. Esp. Phyc. p. 28, 1888.

macrorrhinia Rag., Diag. N. A. Phyc. p. 13, 1887.

Labial palpi porrect, very long, arched above, as long as the head and thorax together; maxillary palpi distinct, small; tongue strong, long; ocelli distinct; antennæ pubescent, bent above base, a strong tuft of scales in bend; basal member bent, the tuft seeming to rise from its summit. Fore wings long, narrow, angles rounded. Genitalia ♂: uncus broad at base, spine short; harpæ broad, with incurved hairs and no spines; lower plate short, conical, nearly truncate on end with stiff hairs, but without spines. Legs slender, tarsi spinose, spurs long and slender. Venation: fore wings 11 veins, 4 and 5 stemmed, 10 separate; hind wings 7 veins, 2 at angle, 3 and 4 long stemmed.

1. **D. aureofasciella** Rag., Diag. N. A. Phyc. p. 13, 1887 (*Macrorrhinia*). —Expands 14—20 mm. Fore wings pale gray, with a slightly brownish tinge; first line broad, slightly oblique, orange colored, preceded by a perpendicular black line; second line pale gray, indistinctly dark margined, indented on the folds, produced in the middle. Discal and marginal dots distinct. Hind wings semi-transparent.

Texas, Arizona; Sonora, Mex. Taken in April, May, June, July, August and October. Varies considerably in depth of ground color, and in the orange band, which is sometimes absent.

DIVIANA Rag.

(Type *eudoreella* Rag.)

Nouv. Gen. Esp. Phyc. p. 27, 1888.

Labial palpi recurved, slender, the second member tufted in front; maxillary palpi filiform; tongue long; antennæ of ♂ hardly bent above base, with teeth in the bend. Fore wings subtriangular. Venation: fore wings 10 veins, 3 and 4 from angle of cell, 5 wanting; hind wings 7 veins, 2 near the angle, 3 and 4 stemmed, 5 wanting.

1. **D. eudoreella** Rag., Nouv. Gen. Esp. Phyc. p. 27, 1888.—Expands 17—19 mm. Fore wings blackish brown, the median field gray cinereous; the lines very indistinct upon costa, approaching on inner margin. First line straight, light gray, posteriorly shaded by a blackish line, which is dilated into a triangular spot upon the costa; second line oblique, angulated upon the fold and at the middle. Discal spots distinct. Hind wings brownish.

"North America."

I have one specimen only, and unfortunately that has no locality label, and lacks the head, so I am unable to tell whether the ocelli are present or wanting.

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HOMŒOSOMA Curt.

(Type *sinuella* Fab.)

Steph., Brit. Ent. iv, p. 311, 1834; Zeller, Isis 1848, p. 585, 599; Hor. Ento. Soc. Ross. (Chil. Cr. Phyc.) xvi, 237; Herrich-Schaeffer, Sys. Bear. iv, 103. 1849; von Heinemann, Pyr. 196, 1865; Grote, Bull. U. S. Surv. Terr. iv, 703, 1878, N. A. Ento. i, 12, 1879; Meyrick, Proc. Linn. Soc. N. S. W. iii, 214, 1878, vii, 159, 1882; Ragonot, Ento. Mon. Mag. xxii, 26, 1885; Westwood, Class. ii, 113; Stephens, Brit. Ento. Haust. iv, p. 311, 1834; Westwood and Humphrey, Brit. Moths i, 233, 1839.

Phycidea Zell., Isis 1839, p. 178.

Labial palpi ascending, rather weak, quite long, filiform, end member about one-half middle member; maxillary palpi distinct, filiform; tongue strong; ocelli distinct; antennæ of ♂ simple, the member above the base having an excision or notch. Genitalia of ♂: uncus light, after the normal pattern; harpe broad, subtriangular, long haired; lower plate broad, short conical, with bristles on the outer edge. Venation: fore wings 10 veins, 4 and 5 stemmed, 8 wanting; hind wings 7 veins, 2 quite distant from angle, 3 and 4 widely separate, 8 very short stemmed with 7.

This genus is known by the excision on the second member of the ♂ antennæ. In some of our species it is not very distinct, and the tendency is evident in some species of other genera. But while thus not sharply marked it is so peculiar that it affords a good generic characteristic.

Synopsis of Species.

1. Fore wings pure white.....2.
   " not white.....3.
2. " broad, apex sharp, insect quite large.....**impressalis.**
   " narrow, apex rounded, insect quite small.....**illuviella.**
3. " lines indistinct or obsolete; shadow lines wanting.....4.
   " lines distinct with shadow lines.....6.
4. " with white costal stripe.....**albescentella.**
   " without distinct costal stripe.....5.
5. Fuscous gray.....**electella.**
   Ochreous gray or white.....**opalescella.**
6. Outer line angulate, within reaching to discal spots.....**stypticella.**
   " nearly straight.....7.
7. Basal shadow line a broad band.....8.
   " " narrow.....**mucidella.**
8. Black band even.....**uncanalis.**
   " with a long angle at middle.....**anguliferella.**

1. **H. impressalis** Hulst, Trans. Am. Ento. Soc. xiii, 163, 1886.—Expands 25—30 mm. Palpi fuscous; head and thorax dirty white; abdomen light fuscous, white at tip. Fore wings white, a little peppered with black scales on anterior

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portion of basal and middle fields, washed slightly with fuscous posteriorly, and on outer space; a broad black band dividing the basal and middle fields, not reaching costa, and broken post-medially, thus forming two subquadrate black spots; two black dots on outer median field, one anterior to the outer; a straight clouded outer band pretty close to outer margin; hind wings light pellucid fuscous, nearly white on anal half; beneath, pale fuscous, hind wings as above.

Colorado.

2. **H. uncanalis** Hulst, Trans. Am. Ento. Soc. xiii, 162, 1886 (*Nephopteryx*). —Expands 25 mm. Palpi, head and thorax cinereous; the collar white, and thorax white laterally. Abdomen cinereous anteriorly, annulated with white; dark fuscous posteriorly, annulated with light fuscous. Fore wings cinereous, costa at base white, the first band broad, black, constricted at costa and inner margin; two black spots well out on the middle field, one behind the other, the posterior ante-median; outer line white, not reaching costa, nearly straight, with dark shadings; outer space gray; marginal line white; hind wings fuscous outwardly, becoming translucent white at base; fringe white, fuscous at base.

Colorado, Nevada.

3. **H. anguliferella** Rag., Diag. N. A. Phyc. p. 16, 1887.—Expands 30 mm. Fore wings dark brownish gray, first line white, broad, shaded by a very broad > shaped blackish band; second line whitish, oblique, straight, inwardly shaded with blackish. Discal spots indistinct. Hind wings brownish white, veins darker.

No locality given.

4. **H. albescentella** Rag., Diag. N. A. Phyc. p. 15, 1887.—Expands 30 mm. Fore wings brownish gray, a broad white costal streak from base to second line, broader in basal area, dusted with gray on the outer edge beyond the middle; first line white, oblique, followed by a broad blackish band, which expands towards inner margin; second line whitish, shaded internally with blackish, indented on the discal fold, below. Discal spots distinct. Hind wings pale brownish gray.

California.

5. **H. illuviella** Rag., Nouv. Gen. Esp. Phyc. p. 33, April, 1888; Hulst, Ento. Am. v, 155, 1889.

candidella Hulst, Ento. Am. iv, 118, September, 1888.

Expands 18—22 mm. Fore wings elongate, narrow, rounded on costa, white, powdered with blackish scales at intervals. First line bent, formed of three black points; the second very indistinct, oblique, blackish. Discal points oblique, the upper nearer the base, the lower large, clear brownish; fringes white.

Arizona, Mexico.

6. **H. opalescella** Hulst, Ento. Am. iii, 138, October, 1887 (*Ephestia*).

tenuipunctella Rag., Diag. N. A. Phyc. p. 15, December, 1887.

Expands 14—18 mm. Palpi, thorax and fore wings dull even ocher white, the head parts faintly washed with fuscous. A faint extra basal fuscous point on fore wing at center, showing probably the location of an obsolete cross line. A

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faint discal point of same color. Extreme outer edge a little fuscous, with fringe composed of intermixed white and dark scales. Hind wings light ocher, with fuscous tinge, stained darker along margin. Beneath light ocher, with outer margins slightly stained.

Texas, California.

7. **H. electella** Hulst, Ento. Am. iii, 137, October, 1887 (*Anerastia*).
texanella Rag., Diag. N. A. Phyc. p. 15, December, 1887 (*Homœosoma*).

Expands 15—24 mm. Palpi fuscous, dark fuscous at tip. Thorax dark fuscous. Abdomen ringed with dark and light fuscous on each segment. Fore wings light fuscous, dusted with fuscous scales. A narrow costal stripe of ground color, without the intermingling fuscous, extending from base nearly to apex. A faint diffuse outer line, oblique, and in good specimens dentate. Hind wings light fuscous pellucid. Beneath fore wings fuscous, hind wings lighter.

Iowa, Texas, Colorado, New Mexico. Taken in March, April, May, June, August and September.

8. **H. mucidella** Rag., Diag. N. A. Phyc. p. 15, 1887.—Expands 18—20 mm. Fore wings ash gray, speckled with black, inner margin washed with reddish gray, costa paler. First line thick, oblique on costa, formed of two black coalescing spots; a third spot on dorsal vein, opposite the first costal spot, preceded by a white spot; second line whitish, shaded internally with blackish, oblique, straight. Discal spots distinct; hind wings whitish; veins fuscous.

Texas, California, New Mexico. Taken in New Mexico in August and September.

9. **H. stypticella** Grote, Bull. U. S. Geol. Surv. Terr. iv, 703, 1878: N. A. Ento. i, 12, pl. ii, 13, 1879.—Dusty whitish gray; wings narrow; a diffuse blackish anterior line; discal spot formed of two blackish, superposed or coalesced spots near the outer line, which is even, oblique, bordered on either side by a blackish shade, the outer of which is sometimes wanting and indicated by a costal mark. Hind wings smoky pellucid, with paler fringes. Beneath smoky, immaculate; average expanse 19 mm.

New York, Texas, Maine.

MOODNA* n. gen.

(Type *pelviculella* Hulst)

Labial palpi erect; maxillary palpi small; tongue strong, long; antennæ ciliate pubescent, bent above base, bend distinct, flattened; ocelli present; fore wings short, stout, rather broad, a scale fold below on costa near base, concealing a tuft of yellow hairs. Fore wings 10 veins, 4 and 5 stemmed, 8 wanting, 10 separate; hind wings 6 veins, 3 and 4 short stemmed, 5 and 8 wanting. Very close to *Manhatta* (*Hornigia*) and *Ephestia*.

* An ancient tribe of Indians in New York, near Newburgh.)

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1. **M. pelviculella** n. sp.—Expands 14 mm. Labial palpi dark fuscous black on end; head and antennæ dark fuscous. Thorax blackish, washed with deep violet-red. Abdomen more ochreous, with reddish dorsally. Fore wings dark fuscous blackish, heavily washed with violet-red on basal field, and less heavily on outer field; basal line broad, quite distinct, even; outer line indistinct near margin, and subparallel with it; discal spots evident. Hind wings fuscous, darker on veins and margin.

Newburgh, N. Y., July 6th. Taken with some cocoons of *Acrobasis betulella* Hulst, from White Birch trees. The cocoon must have resembled that of *A. betulella*, as I could perceive no difference in the cocoons, and this insect must have emerged from one. The food-plant must, from the place of finding, be White Birch (*Betula alba*).

EPHESTIODES Rag.

(Type *gilvescentella* Rag.)

Rag., Diag. N. A. Phyc. p. 16, 1887.

Labial palpi very slightly ascending, filiform, exceeding head, end member longer than middle; maxillary palpi filiform; tongue long, strong; front with heavy scale tuft; antennæ simple, scarcely bent above base, ocelli wanting; fore wings slightly arched, angles rounded; hind wings narrow, anal angle nearly lost, outer and anal margin waved, cilia on anal margin very long; fore wings in ♂ with tuft of scales below on costa. Legs slender, closely scaled; tarsi spinulated; spurs large, heavy. Genitalia unknown. Venation: fore wings 10 veins, 9 wanting, 4 and 5 stemmed on a line with median vein; hind wings 7 veins, 2 at angle, 3 and 4 long stemmed, 5 wanting, 8 very small.

Synopsis of Species.

1. Fore wings gray ..... **gilvescentella.**
   " dark red ..... 2.
2. " basal line straight ..... **infimella.**
   " " rounded outwardly ..... **erythrella.**

1. **E. gilvescentella** Rag., Diag. N. A. Phyc. p. 16, 1887.—Expands 12—16 mm. Palpi gray, heavily sprinkled with black. Front dark fuscous; antennæ fuscous. Thorax fuscous; abdomen gray, interlined with fuscous. Legs dark gray, powdered with black. Fore wings pale gray, median area dark gray, lines whitish, sinuous, black margined in median area. Discal spots distinct. Hind wings transparent, with a bluish tinge.

Arizona, California.

2. **E. infimella** Rag., Diag. N. A. Phyc. p. 16, 1887.—Expands 9—11 mm. Palpi more ascending than type, dark brownish fuscous; front and antennæ dark fuscous; thorax dark reddish; abdomen fuscous. Fore wings narrow, dark gray,

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dusted with black, with a dark red tinge; median area darker; lines indistinct, grayish, the first nearly perpendicular, the second oblique, sinuous. Discal spots indistinct. Hind wings pale fuscous.

North Carolina.

3. **E. erythrella** Rag., Diag. N. A. Phyc. p. 16, 1887.—Expands 16 mm. Head dark reddish fuscous; antennæ dark fuscous; thorax reddish; fore wings rather dilated posteriorly, dark vinous red, dusted with black on costa and veins, and with gray in basal area; lines very indistinct, gray, oblique; the first rounded externally, the second slightly sinuous. Discal dots invisible. Hind wings fuscous.

California.

EURYTHMIA Rag.

(Type *hospitella* Zell.)

Rag., Diag. N. A. Phyc. p. 16, 1887.

Labial palpi erect, equaling head, end member not as long as middle; maxillary palpi filiform; tongue long, strong; antennæ simple, members above base slightly toothed, ocelli very minute; front with scale tuft. Fore wings rather narrow, angles rounded, costa arched, a small tuft of scales beneath. Hind wings narrow, anal angle rounded, outer and anal margin waved, fringes very long. Legs slender, long; tarsi spinulated, heavily so on hind legs; fore tibia = upper tarsus, hind tibia twice upper tarsus. Genitalia of ♂: uncus bifid at end with two short spines, trunk rather long, bifid at base; from the base reaches out a long straight spine, a little curved in and pointed at end; harpe plain, haired; lower plate broad, truncate, conical, somewhat shape of a broad-necked bottle, heavily armed with bristles; within, reaching back to beginning of last segment, a chitinous cylindro-conical tube armed within with overlying laminæ or plates, joined in with tube on one side, oak-leaf in shape, with three to seven teeth or spines on end and outer side. These overlying each other begin below at base of tube and extend out in a spiral, making two complete circles in their course. They are about twenty-six to twenty-eight in number. These laminæ themselves seem to be composed of interfitting plates one to each tooth, somewhat (though more elongate) as the scales of a lily bulb fit in each other. Venation: fore wings 9 veins, 2 at angle, 3 and 4 stemmed one-half length, 5 wanting, 8 wanting; hind wings 2 at angle, 3 and 4 stemmed three-fifths length, 6 separate, 8 very short.

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Synopsis of Species.

Fore wings color gray.....**hospitella.**
" " reddish orange along inner margin.....**ignidorsella.**

1. **E. hospitella** Zell., Verh. Zool.-Bot. Ges., Wien, 1872, p. 338 (Beit. iii, p. 132), (*Ephestia*).

quantulella Hulst, Ento. Am. iii, 134, 1887 (*Pempelia*).

Expands 8—12 mm. Palpi dark fuscous. Head and thorax fuscous gray. Abdomen fuscous. Fore wings narrow, rounded and oblique on outer margin, steel-gray in color. Two cross lines white, the first nearly at the middle, broad diffuse, obsolete at both costa and inner margin, slightly lined outwardly with black; outer line close to margin, three times dentate. Hind wings fuscous. Beneath dark fuscous, the costal region of the fore wings very dark.

Central Texas. I have received specimens taken in April, May, July, August, September and October, so it is very probably two-brooded. There is considerable variation in color in the specimens from light to dark gray, the middle field being generally the darkest.

2. **E. ignidorsella** Rag., Diag. N. A. Phyc. p. 16, 1887.—Expands 12--14 mm. Fore wings narrow, blackish gray, the inner margin broadly suffused with blackish. First line undefined, second line oblique, pale, indistinct, black margined internally. Hind wings semi-transparent, veins pale fuscous.

Arizona, Mexico.

MANHATTA* Hulst, n. gen.
(Type *biviella* Zell.)

Hornigia, Rag. Diag. N. A. Phyc. p. 16, 1887.

Labial palpi erect, light, the end member nearly equaling middle; maxillary palpi small; tongue long, strong; front slightly rounded; ocelli wanting; antennæ simple, or scarcely bent above base in ♂. Fore wings rather broad, apex not much rounded, a tuft of scales below on costa, costa arched; hind wings with strongly oblique outer margin; legs rather heavy, closely scaled, tarsi spinulated; fore tibia longer than upper tarsus, hind tibia about three times upper tarsus. Genitalia ♂: uncus not divided at base, end rather spatulate with projecting spine below, not at end; harpæ large, broad, with fold near middle with long inturned hairs; lower plate broadly conical, truncate with indentation at middle of end, with spinous hairs on outer edges; last segment of abdomen beneath with four hair tufts. Venation: fore wings 10 veins, 3 separate, 4 and 5 stemmed half length, 8 wanting, 10 separate; hind wings 6 veins, 2 distant from angle, 3 and 4 very short stemmed or from a point, 5 and 8 wanting, 6 separate.

* An ancient tribe of Indians living on Manhattan Island, where New York is now situated.

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As already said, by the laws of modern Zöology "once a synonym, always a synonym," and so the term *Hornigia* being a synonym of *Lamoria* Walk. cannot be used for any other genus in Zöology. I therefore propose *Manhatta* in its stead.

Synopsis of Species.

Outer line obtusely angled at middle.....**obtusangulella.**
" sinuous dentate.....**lugubrella.**

1. **M. obtusangulella** Rag., Diag. N. A. Phyc. p. 16, 1887 (*Hornigia*).—Expands 13—18 mm. Fore wings dark vinous red, median area suffused with black; lines whitish, the first nearly perpendicular, second line oblique, obtusely angled in the middle. Discal spots coalescing, followed by a pale grayish cloud. Hind wings semi-transparent, bluish, veins and edge fuscous.

Texas.

2. **M. lugubrella** Rag., Diag. N. A. Phyc. p. 17, 1887 (*Hornigia*).—Expands 16—18 mm. Fore wings gray, with a reddish tinge, dusted with blackish, especially in the median area. Lines whitish, first perpendicular, outwardly shaded with blackish; second line oblique, sinuous dentate, indistinct. Discal spots coalescing. Hind wings pale yellowish gray.

California.

UNADILLA* n. gen.

(Type *nasutella* Hulst)

Labial palpi weakly ascending, short, scarcely reaching summit; tongue strong; maxillary palpi very small; ocelli present; antennæ simple, pubescent. Venation: fore wings 9 veins, 5 and 8 wanting, 2 at angle, 3 and 4 separate, 10 separate; hind wings 7 veins; 2 distant from angle, 3 and 4 separate, 5 wanting, 8 distinct; cell very short.

1. **U. nasutella** n. sp.—Labial palpi nearly white, annulated at base of segments with blackish; head whitish; thorax and abdomen bluish gray; fore wings slightly arched on costa, narrow, apex distinct. Color a light gray washed with fuscous, with some sprinkling of dark scales, except along costa, thus leaving a nearly white costal stripe lost before apex; also somewhat lighter than ground color along inner margin; lines faint, the first scarcely suggested by a darkening of color, the outer even, parallel with outer margin, and near it, very faint. Discal spots faint fuscous. Hind wings whitish gray.

Hot Springs, N. Mex. Taken in September.

EPHESTIA Guen.

(Type *elutella* Hüb.)

Ann. Soc. Ento. France, 1845, p. 319 (Index Meth. p. 81); Zeller, Isis, 1848, p. 585, 592; Herrich-Schaeffer, Sys. Bear. iv, 110, 1849; von Heinemann, Pyr. 201, 1865; Meyrick, Proc. Linn. Soc. N. S. Wales, iii, 215, 1878; iv, 234, 1879; vii, 160, 1882.

* An Indian tribe of the Northwest.

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Labial palpi erect, recurved, rather short, filiform: maxillary palpi distinct, somewhat scale tufted on end; tongue rather strong; ocelli present; antennæ simple, pubescent; fore wings rather long, narrow, with costal fold beneath. Hind wings tufted above near base. Genitalia of ♂: uncus bifid at end, spine rather spreading, a spine at base on each side; harpe simple, long haired; lower plate short and broad, conical truncate, with turned in bristles. Venation: 9 veins, 5 and 8 wanting, 3 and 4 separate, 10 separate; hind wings 6 veins, 5 and 8 wanting, 2 quite far from angle, 3 and 4 stemmed.

Synopsis of Species.

1. Fore wings cream-white..... **rileyella.**
   " otherwise.....2.
2. Basal line followed by a broad black band..... **fuscofasciella.**
   " no broad black band.....3.
3. Color blackish..... **nigrella** n. sp.
   " gray.
4. Costal fold without tuft beneath..... **kuehniella.**
   " with tuft..... **elutella.**

1. **E. rileyella** Rag., Diag. N. A. Phyc. p. 17, 1887.—Expands 20—22 mm. Fore wings cream-white, very sparingly sprinkled with black scales. Lines black, interrupted, distinct; first line perpendicular, formed of two black spots on dorsal and median veins; second line oblique, formed of numerous black dots on the veins. Hind margin spotted with black, the lower discal dot distinct. Hind wings bluish white.

Utah, Mexico. Larva lives in fruit of *Yucca baccata.*

2. **E. fuscofasciella** Rag., Diag. N. A. Phyc. p. 17, 1887.—Expands 26 mm. Fore wings narrow at base, dilated and rounded on costa, posteriorly gray dusted with black, especially on the veins, basal area paler; first line indistinct, slightly elbowed at the middle, shaded externally by a broad blackish band; second line sinuous, indented on discal fold, pale gray, edged with blackish internally. An irregular black lunule on disc. Hind wings pale brownish yellow, the veins fuscous.

Missouri, Texas.

3. **E. kuehniella** Zell., Stett. Ento. Zeit. 1879, p. 476; Snellen, Tids. Ento. xxviii, 237, 1885, pl. viii; Thompson, Entomologist, xx, 66, 1887; Barrett, Ento. Mon. Mag. xxiii, 255, 1887; Riley, Insect Life, i, 315, 1888.—Expands 24-26 mm. Labial palpi blackish gray; head and thorax somewhat lighter; abdomen the same color, with an ocher shade; fore wings even gray, overlaid rather unevenly with blackish scales generally, a little more pronounced on the veins, giving a striated appearance; lines not very distinct, the basal faint, dentate, edged outwardly and faintly with black; the outer gary, with a large inward angle below costa, then finely dentate; marginal spots black. Hind wings light pellucid fuscous.

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North Carolina, New Mexico, Colorado, Canada. Also common in Europe. The New Mexico specimens were taken in August and September.

Zeller describing this insect speaks of it as an importation from America, though unable to give proof of the statement. Mr. Ragonot catalogues it as an American insect, having it from North Carolina. In "Insect Life," April, 1889, vol. i, p. 315, Riley, however, says: "I think it can be safely said this species (*E. kuehniella* Z.) does not occur in the United States."

Whether the species originated in America I am unable to say. I have specimens of this insect from Colorado and New Mexico, which I believe are indigenous. They agree entirely with specimens from Europe and from Canada, where the insect began depredations last year. Mr. Ragonot describes *E. fuscofasciella* from specimens from Texas and Missouri. I have specimens from New Mexico, which connect the two, so *fuscofasciella* may be a variety only.

I have just received, by the kindness of Prof. Fernald, a bulletin on "The Flour Moth," issued by the Provincial Board of Health of Ontario, dated Oct. 19, 1889. In this, information is given of the appearance of *Ephestia kuehniella* in a flour-mill of Ontario. It has multiplied with very great rapidity, and threatens to become a very great pest. I do not know that it has given trouble in California, if indeed it exists there. It has, however, developed very rapidly in Europe, becoming a very great evil. The "Ontario Bulletin" speaks of it as having been probably introduced from Europe, though there is no reason why it should not have come from the Pacific coast.

Miss Omerod, of England, quoted in the "Ontario Bulletin," says the caterpillars are about five-eighths of an inch in length, pale red to white in color; the head is yellowish brown, darker in front; mandibles dark brown; thoracic shield dark brown, with a faint pale central line dividing it on dorsum, and a small brown spot on each side of it on the same segment; a subdorsal and a lateral row of piliferous spots on each side, one spot on each segment in each line. Anal shield oval-triangular, brownish. The caterpillar is covered with a few widely scattered hairs. It lives in flour and meal, making a silken gallery, in which it lives, webbing together masses of the flour. It pupates in a cocoon in this gallery, and emerges as a moth in about three weeks. It may be found almost any time

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during the summer in the imago state, and is probably several brooded; indeed, in the warmth of a mill or house, its development may be continuous during the year.

4. **E. nigrella** n. sp.—Expands 16 mm. Palpi, head, antennæ and thorax blackish fuscous, the thorax with a slight violet shade; abdomen more grayish fuscous. Fore wings gray, overlaid more or less with blackish; first line light gray, broad, straight; outer line close to margin, distinct, sharply and somewhat irregularly dentate; basal field much powdered and spotted with blackish; middle field nearly solid black, except an indefinite band of less deep color including the distinct discal spots; outer field heavily marked, not blackish; below, the costal fold encloses a tuft of yellowish hairs. Hind wings dark to pellucid fuscous, more heavily marked on veins and margin; there is but one tuft of hairs above so far as I can determine.

Central Texas; July and August.

5. **E. elutella** Hüb., Samm. pl. 24, 163 (*Tinea*); Zinck., Germ. Mag. iii, 175, 1818 (*Phycis*); Treit., ix, 1, 194, 1832; Wood, fig. 1454, 1839; West. and Hum. Moths, p. 229. pl. 115, fig. 7; Dup., x, 279, 8; Steph., Ill. Brit. Ins. iv, p. 304, 1834 (*Phycita*); Zeller, Isis 1848, p. 592; Herrich-Schaeffer, Sys. Bear. iv, p. 110; von Heinemann, Pyr. p. 201; Morris, Brit. Moths, iii, pl. 79, fig. 18, 1872; Meyrick, Proc. Linn. Soc. N. S. W. iii, 215, 1878; Trans. Ento. Soc. London, 1887, p. 261; Zeller, Verh. Zool.-Bot. Ges., Wien, 1876, p. 338 (Beit. iii, 132); Verh. Zool.-Bot. Ges., Wien, 1874 (Lep. West. Am. p. 8); Moeschler, Stet. Ento. Zeit. 1880, 393; Verh. Zool.-Bot. Ges., Wien, 1884, p. 310; Fisch., v, Roesl. in Sepp. 2d. S. i, p. 138, pl. 31, figs. 1–8; Wall., Pyr. p. 1053; Bonwst. iii, p. 204, N. 53; Snellen, Vlin. Neth. i, p. 162; De Geer, Ins. i, 16, p. 84; Reum., iii, 1, p. 352, pl. 19, figs. 19–21; Lienig, Isis 1846, p. 266; Frei, Lep. Sch. p. 279, 1880; Büttner, Stet. Ento. Zeit. 1880, p. 393; Christoph, Horæ Ento. Soc. Ross. xii, 224, 1876.

ablutalis Hüb.

elutea Haw., Lep. Brit. 496, 1828.

rufa Haw., Lep. Brit. 497, 1828; Wood, Index 1454, 1839.

angusta Haw., Lep. Brit. 497, 1828.

Labial palpi blackish gray; thorax fuscous gray; abdomen more ochreous; fore wings gray, powdered with blackish, and washed with fuscous along posterior half; first line black, often indistinct, dentate; outer line not far from margin, more distinct, with a tooth inwardly below costa, then finely waved, dentate; discal spots present. Hind wings with two tufts above, light fuscous, deeper on veins and margin.

Found in all parts of the world, living in old fences and decaying wood and rubbish, according to European authorities.

PLODIA Guen.

(Type *interpunctella* Hüb.)

Ann. Soc. Ento. France, 1845, p. 322 (Index Meth. p. 80); von Heinemann, Pyr. p. 202, 1865; Ragonot, Ento. Mon. Mag. xxii, 25, 1885.

Labial palpi ascending, rather heavy, second member triangular, heavy, end member lighter, pointed; maxillary palpi small; tongue

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about four times head, rather weak; ocelli wanting. Genitalia of ♂: uncus a short spine, immediately bifid below, broad, rounded; harpe broad, extended, long haired; lower plate broadly conical, curved up on sides, armed with bristles on outer edge. Venation: fore wings 9 veins, 5 and 8 wanting, 3 and 4 separate, 10 separate; hind wings 6 veins, 5 and 8 wanting, 2 quite far from angle, 3 and 4 stemmed.

1. **P. interpunctella** Hüb., Samm. 310: Treits. Schm. Eu. ix, 1, 196; Dup, x, 280, 5; Suppl. iv, p. 121, pl. 60, 6; Zell., Isis 1848, p. 598; Herr.-Sch. Sys. Bear. iv, p. 110; Stain. Man. ii, 169, 1859; von Heinemann, Pyr. p. 202, 1865; Moeschler, Verh. Zool.-Bot. Ges., Wien, 1884, 310; Rag., Ento. Mon. Mag. xxii, 25, 1885; Zeller, Verh. Zool.-Bot. Ges., Wien, 1875, p. 336 (Beit. iii, 130); Heylaerts in Sepp. 2d S. iii, p. 239, pl. 43, figs. 1-14; Bonwst. iii, p. 204, N. 54; Snellen, Vlin. Neth. Micro. i, 163; Frei, Lep. Sch. p. 279, 1880.

zeæ Fitch, Nox. Ins. N. Y. 1868, 320, pl. iv, fig. 1; Clem., Proc. Ac. N. Sci. Phil. 1860, p. 206.

Roxburghii Gregson, Ento. 1873, N. 114, p. 318.

Labial palpi and head reddish fuscous; thorax dark fuscous, with a reddish shading; abdomen ochreous; fore wings yellow ochreous with a few scattered black scales, to basal line; this line is well out from the base, black, broad, with uneven edges, but with generally even, rounded course from costa to inner margin; narrowly edged with ochreous outwardly, then wing reddish brown to outer margin; middle field costally heavily sprinkled with blackish, which is broken by the somewhat large, oval, yellow ocher discal spot; outer line black, mixed with gray scales, not very distinct, parallel with, and near the outer margin. Hind wings shining, light fuscous.

Fitch says of the larva: "They form cylindrical burrows through the substance on which they feed, lining the sides of the passages with silk; they grow to be about one-half an inch in length, and are of a cylindrical form, slightly broadest in the middle. They are dull white, the sutures between the segments slightly marked, and not constricted. Their heads are hard, hornlike, shining yellow. Thoracic shield is also shining, yellowish white, as is also the anal shield. The surface shows a few scattering hairs, which, on the sides, arise from very faint, smooth, wartlike dots.

"The pupa is pale yellow, or yellowish white, its sutures marked by fine, slender, chestnut-brown lines, and the eyes prominent, rather large and black. It lies in a slight cocoon formed of snow-white silken threads, through which the pupa is visible."

The larva live upon meal, flour, and especially upon preserved fruits and jellies of all kinds. It is found everywhere, and may be found almost any time during the Summer.

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Prof. Forbes writes me he has taken the insect at Urbana, Ohio, at "sugar." Also in Illinois has taken the larvæ in corn, cornmeal, oatmeal, and, strangest of all, found them destroying Lepidoptera in papers. The moths emerged, or were taken from March 11th to September 23d.

BANDERA Rag.

(Type *binotella* Zell.)

Rag., Diag. N. A. Phyc. p. 19, 1887.

Labial palpi porrect, somewhat arched in middle, and drooping at end; maxillary palpi distinct, filiform; tongue distinct, rolled, but short, twice the head; ocelli present; antennæ crenulate pubescent, somewhat bent above base, with a tendency to a roughness of scales in bend; legs slender, long, tarsi hardly spinulated. Genitalia of ♂ (*cupidinella*): uncus long, neck bent, swan-like, bifid at base; harpe long, rather broad winged, exactly like the wing of a maple seed; lower plate conical, rounded, edged with hairs on the outer edge. Venation: fore wings 9 veins, 3 and 4 separate, or from a point, 5 and 8 wanting, 10 separate; hind wings 7 veins, 2 distant from angle, 3 and 4 long stemmed, 5 wanting, 8 very short.

This genus presents a decidedly Crambid-like appearance. The palpi and maxillary palpi are exactly the same, except that the maxillary palpi do not have the spreading scale tuft. The structure of the genitalia is also rather abnormal, thus separating it from what seems superficially to be its congeners.

Synopsis of Species.

Fore wings even whitish ochreous; veins hardly darker.....**subluteella.**
" ocher gray, with two black spots near anal angle.....**binotella.**
" veins white, dusted with black on edges.....**cupidinella.**

1. **B. binotella** Zell., Verh. Zool.-Bot. Ges., Wien, 1872, 554 (Beit. i, 108), (*Anerastia*); Rag., Diag. N. A. Phyc. p. 19, 1887.—Expands 10—14 mm. Labial palpi, head and thorax ochreous, tinged with fuscous; fore wings ocher yellow, tinged with fuscous and gray, especially near middle of wing, not reaching costa, thus forming a broad costal stripe of ocher yellow and by their absence on median vein and vein 1 forming stripes, neither very distinct; generally with two black spots on vein 1 towards inner angle. Hind wings shining, ocher yellow, pellucid.

Texas. My examples were taken early in May; Zeller's type was taken by Belfrage July 12th.

2. **B. subluteella** Rag., Diag. N. A. Phyc. p. 19, 1887.—Expands 16 mm. Fore wings whitish ochreous, with some very fine blackish scales dusted on and about the veins, visible only with a lens. Hind wings yellowish white.

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California, New Mexico. A specimen from New Mexico taken in August.

3. **B. cupidinella** Hulst, Ento. Am. iv, 118, 1888.—Expands 18 mm. Palpi dark gray; head fuscous; thorax ocher fuscous; abdomen ocher; fore wings, ground color buff ocher, with three white stripes, the first subcostal from base to apex, the second starting from first about one-fifth out from base and reaching to middle of outer margin, the third on vein 1; all these are edged with scattered black scales, and all became diffuse and intermediate outwardly so that the ocher, white, and the black scales are quite mixed in submarginal space. Hind wings fuscous pellucid.

Colorado, New Mexico.

TAMPA Rag.

(Type *dimediatella* Rag.)

Rag., Diag. N. A. Phyc. p. 19, 1887.

Labial palpi ascending, somewhat recurved, thick set with scales; maxillary palpi distinct, scale tufted; tongue very short; ocelli present; antennæ spinous pubescent, slightly bent above base; legs long and slender; fore wings rounded. Genitalia of ♂: exactly as in *Bandera*. Venation: fore wings 9 veins, 5 and 8 wanting, 2 near angle, 3 and 4 separate, 10 stemmed with 9; hind wings 7 veins, 2 distant from angle, 3 and 4 long stemmed, 5 wanting, 8 short, stemmed with 7.

A genus which seems to be very close to *Bandera*, differing it seems only in the palpal construction, which is, however, very distinct.

1. **T. dimediatella** Rag., Diag. N. A. Phyc. p. 20, 1887.—Expands 18 mm. Fore wings with the costal half whitish yellow, very sparingly dusted with brownish scales, the dorsal half reddish ochreous. The median vein and nervures are slightly marked with blackish. Hind wings pale yellowish.

Florida, Texas.

PEORIINÆ Hulst.

Synopsis of Species.

1. Fore wings with 11 veins.....2.
   " " 10 veins.....9.
2. Hind wings with 8 veins.....**Ragonotia.**
   " " 7 veins.....3.
3. Fore wings 4 and 5 stemmed.....4.
   " " separate.....6.
4. Hind wings 2 at angle, 3 and 4 stemmed.....5.
   " 2 distant from angle; 3 and 4 separate.....**Martia.**
5. Antennæ ciliate; palpi heavy; wings triangular.....**Maricopa.**
   " crenulate pubescent; palpi very long, slender; wings broad oval. **Volusia.**

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6. Antennæ of ♂ simple or bent above base only.....7.
" bent above base with furrow of scales in bend.....**Cayuga.**
7. Palpi erect.....**Atascosa.**
" porrect.....8.
8. Hind wings 3 and 4 long stemmed.....**Altoona.**
" " separate.....**Aurora.**
9. " 7 veins.....10.
" 6 veins.....17.
10. Palpi erect, or ascending.....11.
" porrect, or drooping.....15.
11. Antennæ simple, or bent above base only.....12.
" bent above base with tuft of scales in bend.....**Wekiva.**
12. Ocelli wanting.....**Hypsotropa.**
" present.....13.
13. Fore wings 4 and 5 stemmed.....**Navasota.**
" " separate.....14.
14. Clypeus grooved; antennæ crenulate; fore wings oval broad, 10 separate.
Homosassa.
Clypeus smooth; antennæ ciliate; fore wings triangular, narrow, 10 with 9.
Dannemora.
15. Clypeus with long tubercle.....**Petaluma.**
" with none.....16.
16. Fore wings 5 present, 8 wanting.....**Saluria.**
" 5 wanting, 8 present.....**Peoria.**
17. Antennæ simple.....18.
" bent above base with scale tuft in bend.....**Statina.**
18. Clypeus with long tubercle.....**Cocnochroa.**
" with none.....**Calera.**

Of the above genera, from superficial indications, I am of the opinion that *Ragonotia*, *Martia*, *Aurora* and *Dannemora*, will be found to belong to the Phycitinæ, rather than the Peoriinæ. But I have not the material upon which to determine their true position, and I provisionally place them here. Other changes may have to be made as opportunity for study is found.

RAGONOTIA Grote.

(Type *dotalis* Hulst.)

Grote, Can. Ento. xx, 75, 1888.

Ciris Rag., Diag. N. A. Phyc. p. 17, 1887.

Palpi long, horizontal or drooping, rather heavy, end member short; maxillary palpi filiform; tongue very small; antennæ finely ciliate, ♀ pubescent; ocelli present, distinct. Venation: fore wings 11 veins, 4 and 5 short stemmed, 10 separate; hind wings 8 veins, 2 near angle, 3, 4 and 5 stemmed, 8 long, close to 7, but not stemmed in my specimens.

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I have only females, and so am able to give no description of the genitalia of the ♂. Mr. Ragonot, in describing the genus, suggests that vein 8 may sometimes be obsolete. From my specimens I do not think this possible, as 8 is long, distinct and separate.

1. **R. dotalis** Hulst, Trans. Am. Ento. Soc. xiii, 164, 1886 (*Anerastia*).
discigerella Rag., Diag. N. A. Phyc. p. 17, 1887.

Expands 26 mm. Palpi, head and thorax fuscous white, with a few scattered black scales. Abdomen fuscous white, with a faint ochreous cast on the posterior part of each segment; fore wings and base ochreous, followed by light cinereous; first cross line blackish, running obliquely outward, strongly angulated at antemedian space, edged with whitish on basal side, and that edged with a broad, even, ochreous fuscous band; middle field white, much peppered with black on anterior half, the same with an ochreous shading on posterior half; discal spot ochreous, annulated with black; outer line oblique, somewhat angulated just before middle, edged outwardly with whitish, and that with a band of same width and color as the one within basal line; outer space cinereous, inclosing a subterminal black line; fringe cinereous; hind wings pellucid white, slightly fuscous on anterior angle; fringe white; beneath, fore wings dirty white, with a faint ochreous shade along costa on outer field, and broadly along inner margin; centrally fuscous; hind wings white, a little fuscous on anterior margin.

Colorado, Arizona.

2. **R. saganella** n. sp.—Expands 32 mm. Labial palpi, head and thorax light gray, heavily dusted with black scales. Abdomen light gray, somewhat annulated with blackish, third and fourth segments ochreous; fore wing narrow at base, costa quite straight; apex, outer margin, and outer angle rounded, inner margin sinuous. Color even light gray, heavily marked with black, and some stained with fuscous, the veins all black lined; lines almost obsolete, the first evidenced by a white spot at inner margin, the outer by a lightening between the black veins. Hind wings clear, shining, iridescent, very light fuscous, the veins and margin darker.

From T. D. A. Cockerell, of West Cliff, Col., where the unique specimen was taken at light, May 24th.

This insect is hardly congeneric with *dotalis*. The wings are differently shaped, the tongue is much longer, being one-half as long again as the palpi, and consequently it lies midway between Mr. Ragonot's two subfamilies.

MARICOPA* n. gen.
(Type *lativittella* Rag.)

This genus resembles *Ragonotia* in palpal construction. The venation is also the same, except that there are but 7 veins in the hind wings, vein 5 being absent. The male is not known, so the antennal construction cannot be given.

* A tribe of Indians in Arizona.

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1. **M. lativittella** Rag., Diag. N. A. Phyc. p. 18, 1887 (*Ciris*), Cat. N. A. Phyc. Ento. Am. v, 114. 1889 (*Ragonotia*).—Female 22 mm. Fore wings dark gray, lines indistinct; first whitish, slightly oblique, preceded by a broad band, half black, half dull reddish ochreous, not attaining the costa; second line sinuous, barely indicated. Discal spots black, distinct. Hind wings yellowish fuscous, edge darker.

Arizona.

VOLUSIA* n. gen.
(Type *roscopennella* Hulst)

Labial palpi long, slender, porrect, end member short, second very long; maxillary palpi very small; tongue wanting; ocelli present; antennæ strongly crenulâte pubescent, not bent above base. Fore wings rounded, oval. Venation: fore wings 11 veins; 4 and 5 stemmed one-half length, 8, 9 and 10 long stemmed; hind wings 7 veins, 2 at angle, 3 and 4 very long stemmed, 8 distinct.

1. **V. roscopennella** n. sp.—Expands 16 mm. Labial palpi deep fuscous red; head and thorax deep wine red; antennæ fuscous red; abdomen ocher reddish; fore wings an even reddish pink, except an ochreous pink longitudinal dash from base outward at middle reaching two-thirds the length of wing; behind this the reddish pink is deepened into fuscous red; lines obsolete; fringes fuscous. Hind wings dark fuscous.

Volusia County, Fla.

ALTOONA† Hulst.
(Type *opacella* Hulst)

Hulst, Ento. Am. iv, 116, 1888.

Labial palpi long, horizontal, second member about four times length of third; maxillary palpi small; tongue small, front slightly rounded; antennæ crenulate pubescent, basal member long, cylindrical, bent above base slightly; ocelli very small, perhaps wanting in ♀; wings quite broad, arched at costa, angles rounded. Legs slender, closely scaled, spurs very long, slender. Genitalia of ♂ almost exactly like those of *Cayuga*. Venation: fore wings 11 veins, 2 distant from angle, 4 and 5 stemmed, 10 stemmed or separate (stemmed with 8 and 9 in type); hind wings 7 veins, 2 at angle, 3 and 4 stemmed, 5 wanting, 6 separate, 8 quite long.

I am much perplexed about this genus. It was described with *opacella* as type. This, in his catalogue, Mr. Ragonot puts under *Tolima* Rag. But *Altoona* differs from *Tolima* in antennal structure, and somewhat in venation. It agrees with *Saluria* Rag. so far as his

* A county in Florida, where type was found.
† An ancient Indian tribe of Pennsylvania.

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diagnosis goes (which is much more imperfect than usual), except that in *Saluria* vein 11 is wanting, while it is present in *Altoona*. But Mr. Ragonot catalogues *tetradella* Zell. and *dichroeella* Rag. (both of which have 11 present, and thus have 11 veins in the fore wings) under *Saluria*. *Ostreella* Rag. I have seen, but could not examine the venation; *rostrella* I do not know at all. Mr. Ragonot makes *glariosella* Zell the type of *Saluria*. This species I have seen, but could not examine venation.

With this explanation I retain *Altoona*, and catalogue under it the species which I know certainly to fall there. Whether it is a synonym of *Saluria* I cannot tell till I learn whether Mr. Ragonot diagnosed *glariosella* correctly.

Synopsis of Species.

1. Posterior half of fore wings blackish.....**opacella.**
   " " not blackish.....2.
2 Fore wings reddish, veins concolorous.....**dichroeella.**
   " fuscous ocherish, veins lined with whitish.....**tetradella.**
   " cross lines distinct; color gray and blackish.....**ardiferella.**

1. **A. opacella** Hulst. Ento. Am. iii, 138, 1887 (*Anerastia*).—Expands 22 mm. Palpi dark gray. Head and thorax fuscous brown. Abdomen light ocher. Fore wings with the portion anterior to the median line white, posterior portion blackish gray. The two colors somewhat merge into each other, and the white, especially posteriorly and outwardly, is dusted with black and fuscous scales. Hind wings ocher fuscous. Beneath, fuscous on fore wings, light fuscous on hind wings.

Central Texas.

2. **A. dichroeella** Rag., Ento. Am. v, 113, 1889 (*Saluria*).—Expands 19 mm. Fore wings oval, narow at base, strongly rounded on costa, costal half whitish, sparingly dusted with reddish brown, the dorsal half grayish brown with a reddish tint, paler on hind margin, but sharply defined and rather darker along the median vein. Hind wings even pale yellowish, the cilia slightly darker.

Resembles very much *bipartitella* Rag. and also *opacella* Hulst.

3. **A. tetradella** Zell., Verh. Zool.-Bot. Ges., Wien, 1872, p. 552 (Beit. i, 106), (*Anerastia*).—Expands 12—16 mm. Labial palpi light ocher, much mixed with fuscous scales; front and thorax ocher fuscous; antennæ fuscous; abdomen ochreous; fore wings ochreous fuscous, a broad costal stripe reaching to apex, powdered between the costal veins with fuscous; a central white stripe across disc reaching to outer margin, there divided; the submedian vein, veins 1 and 6, also lined narrowly with white, all these white lines very narrowly and somewhat brokenly edged with black. Hind wings even light fuscous.

Texas. I have specimens taken in May, June, July, August and September, so the species is probably two brooded.

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4. **A. ardiferella** Hulst, Ento. Am. iv, 118, 1888.--Expands 18 mm. Palpi and head mouse gray, with scattered black scales; thorax gray; abdomen gray, with an ochreous tint; fore wings with a broad gray stripe along costa; base and along inner margin to middle of wing reddish ocher; base with a black dash; outer and center portion of middle field fuscous gray; outer field gray above, fuscous below; basal line white, straight, oblique, with black on costal half outwardly, on inner half inwardly; outer line near margin lined heavily with black on both sides near costa, and all the way inwardly; a marginal line of black points more pronounced near apex; hind wings yellowish fuscous.

Texas, New Mexico.

Mr. Ragonot has placed this species under *Zophodia*, but the entire absence of the tongue will not allow it there. Its appearance is very different from the rest of the genus, and I would suppose it ought not belong to the *Peoriinæ*, but I have not been able to examine the genitalia.

CAYUGA* Hulst.

(Type *gemmatella* Hulst)

Hulst, Ento. Am. iv, 116, 1888.

Labial palpi very long, horizontal, middle member six times length of end member; maxillary palpi very small; tongue about length of head; front bilobed by perpendicular indentation at middle, ocelli present, distinct; antennæ of ♂ with slight swelling at summit of basal member, though not so marked as in *Acrobasis*, above base bent, with three or four members entirely fused in one without teeth, but with a perpendicular ridge of scales on either side forming a deep open furrow; above dentate-crenulate, coarsely pubescent. Fore wings broad, arched at costa, much rounded at inner angle; hind wings rounded outwardly, anal angle comparatively distinct; legs long, slender, closely scaled, tarsi spinulated; fore tibia slightly shorter than upper tarsus, hind tibia twice upper tarsus, upper spurs at middle. Genitalia of ♂: uncus short, not divided at base, spine short, a long sharp spine on each side at base; harpæ broad, truncate at end, eared above, edged with long, stout, inward tending hairs; lower plate chitinous, short spatulate, or broadly conical at end, edged with raised teeth; base on either side with heavy chitinous protuberance, armed on end with two heavy, curved, diverging, rather long spines. Venation: fore wings 11 veins, 2 distant from angle, 4 and 5 stemmed, 10 generally stemmed with 8 and 9; hind wings 7 veins, 2 quite distant from angle, 3 and 4 stemmed one-third length, 5 wanting, 6 separate, 8 long.

* An ancient tribe of Indians in New York.

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Mr. Ragonot, in his catalogue, places this as = *Poujadia* Rag., but the maxillary palpi are not tufted, and the antennæ are very different. It is much nearer *Mangala* Rag., and seems to me to be the same, but in the diagnosis of that genus some structural characters are omitted, and I let it stand till these are known.

Synopsis of Species.

Fore wings with costal stripe only.....**gemmatella.**
". " and submedian stripe .....**bistriatella.**

1. **C. gemmatella** Hulst, Ento. Am. iii, 134, 1887 (*Spermatophthora*).—Expands 22—26 mm. Palpi ocher, with a reddish tinge. Head, thorax, abdomen and fore wings ocher washed with bright reddish wine color. This on the fore wings is lighter on subcostal and costal veins forming a light ocher line, and the red is slightly darker just behind the subcostal space, and is somewhat brighter basally and apically. Hind wings light fuscous. Beneath fuscous, lighter on hind wings.

Illinois, Colorado.

2. **C. bistriatella** Hulst, n. sp.—In size and general appearance very like *gemmatella*. It differs in structure in that in the fore wings 10 is separate from 8 and 9; the color is much lighter, being reddish ochreous, the costal stripe more distinct; there is also more fuscous posterior to the costal stripe, and also a stripe, nearly the light ocher ground color without any reddish, just anterior to vein 1 extending from near the base almost or quite to the outer margin. Hind wings smoky pellucid.

Taken at San Bernardino, S. Cal., the last week in June.

MARTIA Rag.

(Type *arizonella* Rag.)

Rag., Diag. N. A. Phyc. p. 18, 1887.

Labial palpi long, horizontal, somewhat drooping; maxillary palpi filiform; tongue very small; antennæ simple. Venation: fore wings 11 veins, 4 and 5 separate, 10 separate; hind wings 7 veins, 2 distant from angle, 3 and 4 separate, 5 wanting.

1. **M. arizonella** Rag., Diag. N. A. Phyc. p. 18, 1887.—Expands 16 mm. Fore wings dark brownish gray, finely dusted with black, the costa whitish ochreous dusted with blackish. Lines white, fine and distinct, the first with the costal half oblique, lower half perpendicular; second line oblique, nearly straight, followed by an ochreous band. A large ochreous spot on disc. Hind wings yellowish fuscous.

Arizona.

AURORA Rag.

(Type *longipalpella* Rag.)

Rag., Diag. N. A. Phyc. p. 18, 1887.

Labial palpi very long, horizontal, second member rounded and

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swollen above, third member long and thin; tongue very small; ocelli present, distinct. Venation: fore wings 11 veins, 4 and 5 long stemmed, 10 stemmed with 8 and 9; hind wings 7 veins, 2 distant from angle, 4 separate from angle, 5 wanting, 7 and 8 separate.

I have never seen this insect, and the above is all that is given by Mr. Ragonot, and this was from the ♀ only.

1. **A. longipalpella** Rag., Diag. N. A. Phyc. p. 18, 1887.—Female expands 22 mm. Fore wings blackish gray, whitish on the costa; lines blackish, very oblique, very approximate at inner margin; the first is nearly straight, the second is indented on discal fold. Discal spots invisible. Hind wings pale brownish gray.

No locality is given with the description, so it may not belong to our fauna.

ATASCOSA* n. gen.
(Type *bicolorella* Hulst)

Labial palpi longer than head, ascending, end member horizontal, second member heavily scaled, end member short, about one-fifth second member; maxillary palpi with scales nearly as long as labial palpi, uneven in length, black at end; tongue very small; front subquadrate, slightly rounded; ocelli distinct; antennæ ♂, pubescent, hardly crenulate, bent above base, without scale tuft; legs rather slender, long, tarsi spinulated. Fore wings subparallel, angles rounded; hind wings anal angle quite distinct, inner margin short. Genitalia not studied. Venation: fore wings 11 veins, 4 and 5 stemmed one-half length, 10 separate; hind wings 7 veins, 2 at angle, 3 and 4 stemmed one-half length, 5 wanting, 8 distinct, stemmed with 7.

Very close to *Poujadia* Rag., differing somewhat in venation, wing shape, antennal structure, and in type in maxillary palpi, but in all not very strongly.

1. **A. bicolorella** n. sp.—Expands 14 mm. Labial palpi fuscous ochreous, mixed with blackish; maxillary palpi same color, black at ends; antennæ ochreous; thorax fuscous; abdomen grayish ochreous; fore wings reddish ocher, mixed with dark scales, the reddish being most distinct at base and along inner margin. A broad whitish costal stripe reaching apex, marked with reddish at base, edged posteriorly with blackish, which basally forms a heavy dash. Hind wings even light fuscous.

Central Texas. August.

2. **A. floscella** n. sp.—Expands 12 mm. Labial palpi short, heavy, the end member very short, the second heavily scaled, and with the head fuscous gray

* An ancient tribe of Indians in Texas.

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in color; thorax light fuscous gray; abdomen with an ocher tone. Fore wings whitish, stained with fuscous on posterior half, and with scattered blackish scales on anterior half; the basal line indicated by two distinct black spots just within the middle of wing and situated on the cell and median vein; the outer line faint, shown by a continuation of whitish color across the wing, rather diffuse, obscurely angulate, with several fine black spots on veins showing the shadow line; discal spots obsolete. Hind wings light, shining, faintly fuscous; maxillary palpi pencil tufted, tongue quite short.

Texas.

This species is hardly congeneric with *bicolorella*, and is perhaps better located under *Poujadia* Rag., but it is well to place it here till the full structural characters of *Poujadia* are made known. It is, I think, the smallest of all species with tufted maxillary palpi.

SALURIA Rag.

(Type *maculivittella* Rag.)

Annales Ento. Soc. France, 1887, p. 258.

Near *Ematheudes*. Antennæ of ♂ strongly crenulate or pectinate, without a scale tuft; labial palpi extended forward; maxillary palpi filiform. Fore wings with 10 veins (11 wanting), 10 from the cell, 4 and 5 stemmed; hind wings with 7 veins.

This is Mr. Ragonot's description of the genus. I have not been able to examine the following species, so cannot be sure his reference is correct. All the other species of our fauna referred by him to *Saluria* have 11-veined fore wings.

Synopsis of Species.

1. Fore wing reddish, without costal stripe.....**rostrella.**
   " not reddish, with costal stripe.....2.
2. Veins white, size very large.....**ostrella.**
   Veins concolorous, size small.....**glareosella.**

1. **S. ostrella** Rag., Diag. N. A. Phyc. p. 18, 1887.—Expands 34 mm. Fore wings pale brownish ochreous with a pearly luster; costa broadly white, less so towards apex; median vein and nervures white, cilia white. Hind wings pearly white.

Arizona.

2. **S. rostrella** Rag., Diag. N. A. Phyc. p. 18, 1887.—Expands 24 mm. Fore wings reddish ochreous, paler towards the inner margin, veins hardly paler. Hind wings yellowish white.

California.

3. **S. glareosella** Zell., Verh. Zool.-Bot. Ges., Wien, 1872, p. 553 (Beit. i, 107), (*Anerastia*).—Expands about 18 mm. Labial palpi ocher gray; head gray; tongue short; antennæ yellowish gray; thorax brown-gray; abdomen yellow

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ocher; fore wings broad, rounded, nearly oval; color violet-gray. darkest over the fold as an edging to the costal stripe reaching from the base outwardly; costal stripe whitish, broad, covering nearly or quite half the wing. slightly powdered with brown scales, discal points obsolete; hind wings pellucid, yellowish white. Beneath fore wings brown gray, hind wings light fuscous.

Texas.

Zeller says his type was taken August 15th.

NAVASOTA Rag.
(Type *hebetella* Rag.)

Rag., Diag. N. A. Phyc. p. 18, 1887.

Labial palpi oblique, ascending, third member horizontal; maxillary palpi filiform; antennæ thick, pubescent, a very flattened tuft of scales in bend above base; ocelli present; fore wings 10 veins, 10 from the stem of 8 and 9, 2 distant from angle, 3 and 4 stemmed, 5 wanting. Hind wings 7 veins, 2 distant from angle, 3 and 4 on a long stem, 5 wanting, 8 stemmed with 7.

1. **N. hebetella** Rag., Diag. N. A Phyc. p. 18, 1887.—Expands 16 mm. Fore wings reddish ochreous, paler on inner margin. Costa with a broad whitish streak, not reaching apex. and finely streaked with reddish brown. Hind wings pale yellowish.

Texas.

HYPSOTROPA Zell.
(Type *limbella* Zell.)

Isis 1848, p. 591; von Heinemann, Pyr. p. 200, 1865.

Labial palpi erect, end member fine, sharp, middle member heavily scaled; maxillary palpi filiform; tongue wanting; ocelli wanting; antennæ of ♂ ciliate, bent above base, without tuft. Fore wings 10 veins, 3 and 4 separate, or at a point, 5 wanting, 10 separate, or stemmed with 8 and 9; hind wings 7 veins, 2 near angle, 3 and 4 stemmed, 5 wanting, 7 and 8 separate or stemmed.

1. **H. luteicostella** Rag., Diag. N. A. Phyc. p. 19, 1887.—Expands 17 mm. Fore wings dark red, with a broad pale yellow costal streak, not reaching apex. and tinged with reddish at base. It is bordered with black underneath. Hind wings yellowish fuscous.

Florida.

DANNEMORA* n. gen.
(Type *edentella* Hulst)

Labial palpi erect, long, slender; maxillary palpi very small; tongue weak, but about three times length of head; ocelli present; antennæ simple, pubescent. Fore wings long, narrow; apex much

* An ancient Indian tribe of New York.

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sharper than usual, anal angle well determined; hind wings broad, rounder on outer margin. Venation: fore wings 10 veins, 3 and 4 separate, 5 wanting, 10 stemmed with 8 and 9; hind wings 7 veins, 2 at angle, 3 and 4 stemmed, 5 wanting; cell short.

1. **D. edentella** n. sp —Expands 15 mm. Labial palpi gray, mixed with blackish scales; front fuscous, tuft gray; thorax and abdomen fuscous; fore wings fuscous gray, much marked with blackish on costal median space, and outwardly; discal spots distinct; basal line determined by dark shading; outer line close to margin and parallel. grayish, broad, even. shaded on both sides with blackish. Hind wings dark fuscous.

S. Florida. April.

PEORIA Rag.

(Type *hæmatica* Zell.)

Rag., Diag. N. A. Phyc. p. 19, 1887.

Labial palpi horizontal, long, swollen in the middle; maxillary palpi very small; tongue short; front rounded, broad; antennæ crenulate, pubescent, slightly or not at all bent, but with second segment above base very long, and with a fine perpendicular line of scales where bend should be; ocelli present, small. Fore wings rounded, broad. Legs rather long, closely scaled, tarsi spinulated. Genitalia of ♂: uncus broad, rounded, toothed within with two spines; harpe broad, bilobed at end, the lower portion edged with long hairs, making something of an anal tuft, the upper at upper portion with a spine; a double heavy spine at base of harpe, and another within the base; lower plate wanting. Venation: fore wings 10 veins, 5 wanting; 8, 9 and 10 long stemmed; hind wings 7 veins, 2 at angle, 3 and 4 long stemmed, 7 and 8 stemmed.

1. **P. hæmatica** Zell., Verh. Zool.-Bot. Ges., Wien, 1872, p. 555 (Beit. i, 109), (*Anerastia*).

roseatella Pack., Ann. N. Y. Lyc. Nat. Hist. x, 270, 1873; Grote, Bull. U. S. Geol. Surv. iv, 704, 1878; N. A. Ento. i, 12, pl. ii, fig. 14, 1879.

Expands 16—20 mm. Head and thorax dull yellow, more or less stained with rosy brown. Fore wings with a pale yellow costal stripe running to a point not reaching apex, otherwise the fore wings are dull roseate shading to fuscous or blackish below the stripe, and to yellowish along inner margin. Hind wings pale yellowish fuscous; all fringes yellowish. Beneath yellowish fuscous.

Massachusetts, New York, Pennsylvania, Texas, Colorado, Ohio, Illinois, Iowa.

Prof. Forbes has taken this insect at electric light from June 3d at various times, to September 20th; the greater number being taken in June.

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This insect varies very considerably in general appearance. The reddish color is often entirely wanting in fresh specimens. Those from Texas and Colorado have, as a rule, the reddish always present and deepened in tone. The eastern examples incline to a more faded ochreous appearance; one of Packard's types is of this color, the other rosy.

2. **P. bipartitella** Rag., Diag. N. A. Phyc. p. 19, 1887.—Female expands 15 mm. Fore wings with costal half, except on hind margin, whitish, dusted with blackish; dorsal half and hind margin reddish ochreous, finely dusted with black posteriorly, the dividing line blackish towards base. Hind wings yellowish, clouded with fuscous on the margin.

North Carolina.

I do not know this species. I would suppose it to be close to, if not identical with, the more ochreous variations of *hæmatica*.

HOMOSASSA* n. gen.

(Type *ella* Hulst)

Labial palpi ascending, slender, filiform, end member short; maxillary palpi filiform; front swollen on each side, a perpendicular groove in middle; tongue very small; antennæ crenulate, pubescent; ocelli present; legs rather short, tibial epiphysis longer than usual. Genitalia of ♂: uncus a broad, rounded plate like *Cayuga;* harpe bilobed, the upper part transformed into a long, stout, curved spine; a short stout spine at base; lower plate wanting. Fore wings rounded, rather broad; fore wings 10 veins, 3 and 4 separate, 5 wanting, 10 separate; hind wings 7 veins, 2 at angle, 3 and 4 long stemmed, 8 stemmed with 7, long.

1. **H. ella** Hulst. Ento. Am. iii, 138, 1887 (*Ephestia*).—Expands 14—18 mm. Head parts very dark fuscous. Thorax very dark fuscous in front, lighter behind. Abdomen orange fuscous on anterior segments, light fuscous on posterior. Fore wings even blackish brown, with a costal stripe between subcostal and edge, clay white in color, with a slight intermixture of brown scales, beginning at base running to a point, and becoming obsolete just before apex. The division between the two colors of the wing is sharp, and they stand in strong contrast. The males seem to be slightly lighter in the prevailing color of the fore wing. Hind wings dark fuscous. Beneath dark fuscous.

Florida. May.

Mr. Ragonot catalogues this as an *Anerastia*. It is sufficiently distinct from that genus by the presence of ocelli and the absence of a frontal tubercle.

* An ancient tribe of Indians in Florida.

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WEKIVA* n. gen.
(Type *nodosella* Hulst)

Labial palpi long filiform, ascending; maxillary palpi very small; tongue wanting; antennæ crenulate pubescent, hardly bent above base, a small ridge of scales in bend; ocelli present; legs long, slender; spurs slender, long; middle and hind tibiæ with tuft at end. Genitalia of ♂: uncus broad, rounded, almost semicircular, spine very short; harpe broad, with a long incurved spine at upper end and one at base; lower plate wanting. Fore wings broad, oval, 10 veins, 4 and 5 separate, 10 stemmed with 8 and 9; hind wings rounded, oval, 7 veins, 2 at angle, 3 and 4 long stemmed, 5 wanting.

1. **W. nodosella** n. sp.—Expands 14—16 mm. Labial palpi, front, and thorax light fuscous, washed strongly with reddish; abdomen ochreous fuscous, with reddish shade at base. Fore wings narrowly along costa, and on more than posterior half deep reddish; a not very broad whitish stripe just before subcostal vein not reaching apex; this is edged behind with a blackish band which gradually fades away into the reddish ground color. Hind wings light fuscous, darker with a yellowish red shade outwardly.

Florida. April.

I have an impression this may be the same as *Hypsotropa luteicostella* Rag. It has ocelli, but otherwise agrees very well. But Mr. Ragonot may have omitted an examination of the ocelli.

PETALUMA† Hulst.
(Type *illibella* Hulst)

Hulst, Ento. Am. iv, 116, 1888.

Labial palpi long, rather heavy, drooping; maxillary palpi very small; tongue nearly wanting; front with a long conical tubercle, truncate near the end, two-thirds across from above; antennæ simple; ocelli present; fore wings 10 veins, 3 and 4 stemmed, 5 wanting, 10 stemmed with 8 and 9; hind wings 7 veins, 2 at angle, 3 and 4 on a long stem, 5 wanting, 8 stemmed with 7, but quite long and very distinct.

Another case I suspect of error somewhere. Mr. Ragonot's genus *Cœnochroa* is very near this, but he says there are but six veins in the hind wings. The type of *Cœnochroa* is *californiella*. I have seen the insect, but could not examine venation; I have an insect I thought by comparison to be that species, but that has seven veins

* An ancient tribe of Indians in Florida.
† An Indian name in California.

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in hind wings. I have both *inspergella* and *puricostella* = *illibella* Hulst, and both these have seven veins in the hind wings, so I fancy there may be some mistake.

Synopsis of Species.

Fore wings with costal stripe.....**illibella.**
" with no costal stripe.....**inspergella.**

1. **P. illibella** Hulst, Ento. Am. iii, 138, October, 1887, (*Anerastia*).
puricostella Rag., Diag. N. A. Phyc. p. 20, December, 1887 (*Cœnochroa*).

Expands 16—20 mm. Palpi light ocher fuscous. Head and thorax light ocher with fuscous tinge. Fore wings light ocher, lightest along costa, forming an indistinct stripe, and darkest just behind subcostal vein. A slight powdering of fuscous scales, more marked on the veins. Hind wings white. Beneath light ocher on fore wings, white on hind wings.

Texas.

2. **P. inspergella** Rag., Diag N. A. Phyc. p. 20, 1887 (*Cœnochroa*).—Expands 23 mm. Fore wings pale yellowish ochreous, much and evenly dusted with blackish in lines on the veins; cilia pale yellow, lower discal spot distinct. Hind wings yellowish white.

Texas, Arizona.

I have little doubt this is a variety only of the preceding species.

STATINA Rag.

(Type *roseotinctella* Rag.)

Rag., Diag. N. A. Phyc. p. 19, 1887.

Labial palpi nearly porrect, rather long; maxillary palpi small; tongue small; antennæ crenulate pubescent, bent above base, clothed with appressed scales in the bend, basal member long and thick; ocelli present. Fore wings 10 veins, 3 and 4 long stemmed, 5 wanting, 10 stemmed with 8 and 9; hind wings 6 veins, 2 at angle, 4 and 5 wanting, 8 present, stemmed.

A peculiar genus in lacking two veins of the submedian series in hind wings.

1. **S. roseotinctella** Rag., Diag. N. A. Phyc. p. 19, 1887.—Expands 17 mm. Fore wings red, with a rosy hue, costa slightly pale, distinctly streaked with red, and bordered below with blackish to the median vein; second line indicated by some short black streaks on the median nervures and dorsal vein. Hind wings pale yellowish fuscous.

Florida.

2. **S. gaudiella** n. sp.—Expands 13 mm. Palpi and antennæ ochreous fuscous; abdomen ochreous. Fore wings squamose; ground color ochreous, with a faint violet fuscous tinge, this sprinkled with lengthened black scales, much

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more thickly about basal line and within outer line forming indeterminate blackish bands; lines indistinct, indeterminate, not evident except by the blackish scaling; costa on outer field darker, with black scales; hind wings yellowish fuscous, darker on veins.

Differs from typical *Statina* in that cells of both wings are very short.

CALERA Rag.

(Type *punctilimbella* Rag.)

Rag., Nouv. Gen. Espec. Phyc. p. 50, 1888.

Labial palpi oblique, long, second member subtriangular; antennæ of ♂ simple, the basal member enlarged, slightly bent on the inner side. Fore wings 10 veins, 2 at angle, 3 and 4 stemmed, 5 wanting, 10 stemmed with 8 and 9; hind wings with 6 veins, 2 at the angle, 3 and 5 wanting, 7 and 8 stemmed.

Another genus with two veins of submedian series wanting in hind wings; the two genera are very close to each other; indeed, are almost identical.

1. **C. punctilimbella** Rag., Nouv. Gen. Phyc. p. 50, 1888.—Expands 18 mm. Fore wings reddish ochreous, more dense along the costa, more clear at inner margin; costa with a broad and distinct band, ocher white, narrowed posteriorly; external border marked with blackish points; hind wings yellowish white, pellucid.

Resembles *hæmatica* Zell. "Carolina, N. A."

CŒNOCHROA Rag.

(Type *californiella* Rag.)

Rag., Diag. N. A. Phyc. p. 20, 1887.

Labial palpi horizontal, swollen in middle, above thickened with scales; maxillary palpi invisible; front of head produced into a horny cone; antennæ slightly flattened, and shortly pubescent; fore wings 10 veins, 2 at angle, 3 and 4 on a long stem, 5 wanting, 10 stemmed with 8 and 9; hind wings 6 veins, 2 distant from angle, 3 and 5 wanting, 8 stemmed with 7.

1. **C. californiella** Rag., Diag. N. A. Phyc. p. 20, 1887.—Expands 25 mm. Fore wings pale ochreous, slightly washed with reddish ochreous on the costal half, sparingly dusted with black on the veins; the lower discal spot blackish; ciliæ white; hind wings white, somewhat dusted with fuscous posteriorly.

California.

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Species unknown and probably not properly determined.

Nephopteryx rubiginella Wlk., C. B. M. pt. 27, p. 55, 1863.—♂ and ♀. Dingy cinereous. Head and fore part of the thorax more or less rusty red; maxillary palpi short, porrect; wings with a long, pale, cinereous, slightly interlined fringe. Fore wings hoary, narrow, somewhat rounded at the tips, mostly overspread hindward with a rusty hue; discal dot and marginal points blackish; costa straight; exterior border convex, oblique; ♂ labial palpi with a long pencillate tuft of testaceous hairs. Antennæ incrassated towards the base. Abdomen extending a little beyond the hind wings; ♀ labial palpi erect, rising a little higher than the vertex; third joint lanceolate, less than half the length of the second. Length of body 5—5.5 lines, of wings 13—15 lines.

United States.

Nephopteryx transitella Wlk., C. B. M. pt. 27, p, 54, 1863.—Female cinereous. Proboscis distinct; palpi slightly decumbent, pubescent, rather stout; third joint elongate, conical, full half the length of the second; antennæ rather stout; abdomen extending a little beyond the hind wings; fore wings rather narrow, hardly acute, mostly hoary, except towards the inner border; interior and exterior lines blackish, undulating, dentate, rather diffuse; discal dot blackish, elongated; marginal points black; costa straight: exterior border slightly convex and oblique; hind wings with a slight æneous tinge. Length of body 5 lines, of wings 14 lines.

United States.

Possibly *Zophodia grossulariæ* Pack.

Nephopteryx seminivella Wlk., C. B. M. pt. 35, p. 1717, 1866.—Female blackish cinereous. Head, body beneath, legs and hind wings, pure white. Palpi white, slightly ascending, extending somewhat beyond head, a little shorter than the breadth of the latter; third joint black, lanceolate, less than half the length of the second. Antennæ slender. Abdomen cinereous above, extending much beyond the hind wings. Legs slender; fore wings narrow, rounded at the tips; an irregular, cinereous, not oblique, sometimes interrupted antemedial line; a few small cinereous marks near the outer side of the line; exterior border convex, rather oblique. Length of body 4.5 lines, of wings 13 lines.

United States.

Eurhodope approximella Wlk., C. B. M. pt. 35, p. 1722, 1866.—♂ ♀ pale straw color. Palpi porrect, squamous, much longer than the breadth of the head, third joint lanceolate, not more than one-fourth length of second. Antennæ of ♂ minutely setulose. Abdomen extending much beyond the hind wings. Wings with a slight æneous tinge; fore wings with a brown subcostal stripe, which is diffuse and reddish on the hind side; hind wings white, semi-hyaline. Length of body 3.5 lines, of wings 9 lines.

North America.

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Stantira variegata Wlk., C. B. M. pt. 27, p. 76, 1863.—♂ reddish cinereous, whitish cinereous beneath. Head and thorax blackish cinereous. Wings with black marginal points; fore wings irregularly blackish cinereous along the costa, which has black points towards the tip; hind wings whitish cinereous with a black discal spot. Length of body 6 lines, of the wings 12 lines.

St. Martin's Falls, Albany River, Hudson Bay, Can.

In the generic description of *Stantira* Mr. Walker says the proboscis is short, the palpi porrect, the antennæ smooth.

Cutina albopunctella Wlk., C. B. M. pt. 35, p. 1735, 1866.—♂ hoary, with a slight æneous tinge. Wings pale fawn color, slightly æneous tinged; marginal points black; fore wings with white veins; costal space diffusedly streaked with white; a diffuse, zigzag, white submarginal line; fringe with a white streak opposite each black point; under side diffusedly whitish along the costa, and along exterior border. Hind wings with a whitish tipped fringe; underside whitish, with fawn colored speckles, and with a black dot in the disc. Length of body 6 lines, of wings 12 lines.

United States.

In the generic description Mr. Walker says: proboscis rather long and stout, palpi slender, obliquely ascending; antennæ stout pubescent.

Subrita abrostella Wlk., C. B. M. pt. 35, p. 1744, 1866.—♀ shistaceous, stout, cinereous beneath. Palpi porrect, stout, squamous, as long as the breadth of the head; third joint lanceolate, about one-fourth the length of the second. Antennæ and legs stout. Wings broad; fore wings acute, brown speckled, varied with ferruginous and with whitish; a large, ochraceous, whitish, basal spot, bordered on the outer side by two undulating black lines; a zigzag, black, antemedial line; a double, slightly curved, outward black, postmedial line, which forms an acute angle near costa, a white point and a white spot in the disc, the latter including a reniform brown mark; a broad, zigzag, whitish submarginal line; two black streaks extending from the exterior border opposite the angle of the post-medial line; a row of black points, which are very near the exterior border. Hind wings æneous; marginal line ferruginous; fringe whitish, interlined with pale brown. Length of body 5 lines, of wings 13 lines.

United States.

Pempelia virgatella Clem., Proc. Acad. N. Sci. Phil. 1860, p. 205.—Brownish luteous; fore wings varied with grayish toward the base and tip, with dull pale reddish at base and middle of inner margin; on the middle of the costa is a blackish blotch, containing a short line of the same hue, and opposite a whitish angulated line with few black spots exterior to the costal line; a blotch of the same hue towards the base of the submedian nervure, and a pale, grayish, subterminal line, margined internally by a blackish line, and externally by black streaks on the nervules; the internal black margin is edged on the costa and middle of the wing with pale grayish; hinder margin spotted with black, cilia grayish fuscous. Hind wings pale brownish; labial palpi erect; maxillary palpi with a short pencil of hairs; tongue long.

Pennsylvania.

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This is almost certainly *Salebria contatella* Grt. Dr. Clemens' types are lost, and it will be impossible, probably, to determine all his species from the descriptions. The tufted maxillary palpi of this and the next species narrow their possibilities to only four or five species. I have very little doubt that this and the next are forms of *contatella*.

Pempelia subcæsiella Clem., l. c. p. 206.—Male pale bluish gray, dusted with fuscous: fore wings with a reddish luteous band at base, broadest on inner margin, and a rather broad, dark fuscous band on the basal third. The subterminal line is pale grayish, edged behind with dark fuscous. Hind wings pale brownish. Labial palpi erect; maxillary palpi pencil tufted, tongue long.

Pennsylvania.

Ephestia ostrinella Clem., l. c. p. 206.—Reddish purple, varied with blackish; fore wings with the basal third and the apical portion reddish purple, with a broad blackish band in the middle, edged internally by a straight whitish line, and an exterior costal patch of the same hue containing two black dots on a short streak; the subterminal line is pale grayish. Hind wings pale brownish gray.

"The larva lives in the fruit heads of the Sumach, passing the Winter in the larval state. It is dark reddish brown, head brown, cervical and terminal shields blackish brown. The body is supplied with a few isolated hairs, and one or two rows of obscure, dark brown, subdorsal spots.

"The larvæ make galleries through the fruit heads and desert them in the Spring to form their cocoons, which are slight silken webs, and they appear as imagos about the middle of April."

This will in time be determined by the larvæ in connection with the description of the imago. I have never been able as yet to find the larvæ myself, though I have sought them often.

Ephestia ficulella Barn. will probably be taken in this country. It looks like *E. elutella*, has the same larval habits, is said to be as widely spread by commerce. It differs in having but one tuft of hairs above on hind wing of ♂. I have never seen a specimen taken in America.

Catalogue of Undetermined Species.

1. **Nephopteryx rubiginella** Wlk.
2. " **transitella** Wlk.
3. " **seminivella** Wlk.
4. **Eurhodope approximella** Wlk.
5. **Pempelia virgatella** Clem.
6. **Pempelia subcæsiella** Clem.
7. **Ephestia ostrinella** Clem.
8. **Stantira variegata** Walk.
9. **Cutina albopunctella** Walk.
10. **Subrita abrostella** Walk.

Some of these may not be Phycitidæ.

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Notes on other Species described as Phycitidæ.

On the authority of Prof. Fernald, who examined the types in the British Museum, I am able to give the following synonymy:

Sebunta guttulosa Walk., C. B. M. pt. 27, p. 78, is a *Botis*, and equals *Botis illibalis* Hüb.

Nephopteryx intractella Walk., C. B. M. pt. 27, p. 55, is a synonym of *Blepharomastix ranalis*, which Prof. Fernald tells me is itself a synonym of *Botis similalis* Guen. The species has fourteen names.

On the authority of Mr. William Warren, of the British Museum, from a letter which has reached me just as these MSS. were going to print, I am able to make the following statements with regard to some species of Mr. Walker:

Prof. Fernald's references of *Nephopteryx intractella* and *Sebunta guttulosa* are repeated.

Acrobasis latiorella Walk., C. B. M. pt. 27, p. 29, 1863, is a *Noctuid* belonging to the Deltoidæ.

Nephopteryx subcanalis C. B. M. pt. 27, p. 56, 1863, is an *Epipaschiid*, belonging to *Tetralopha*, or a new genus near it.

Benta expandens Walk. C. B. M., pt. 27, p. 112, 1863, is a synonym of *Tetralopha asperatella* Clem.

Nephopteryx transitella and *N. rubiginella* are true Phycitidæ.

Mr. Ragonot, in his catalogue, places under the head of "species unknown" to him, *Pempelia approximella* Walk. He refers probably to *Eurhodope approximella* Walk. C. B. M. pt. 35, p. 1722, 1866. Upon what ground he calls it *Pempelia* I do not know.

Mr. Ragonot also places in his catalogue of N. A. Phycitidæ *Euzophera cuprotæniella* Christoph. This species was described by Mr. Christoph in the "Bulletin Soc. Nat. Moscow," 1881, p. 58. The title of the paper is "Neue Lepidopteren des Amurgebietes." The locality is given as "Wladiwostok, Amurland." I am unable to find any authority for a belief that it is an American species, and have consequently not given it a place as such in this paper.

Nephopteryx indistinctalis Walk. and *N. bifascialis* Walk., C. B. M. pt. 27, p. 59, 1863, are both placed by Mr. Ragonot in his catalogue as North American Phycitidæ, under the head of "unknown species." They were, however, both described from Brazil, and do not belong to our fauna.

Tehama bonifatella Hulst, Ento. Am. iii, 135, 1887.

Uinta oreadella Hulst, Ento. Am. iv, 116, 1888.

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Welaka multilineatella Hulst, Ento. Am. iii, 134, 1887.

Anerastia cestalis Hulst, Trans. Am. Ent. Soc. xiii, 164, 1886.

The above four species are *Crambids*.

Myelois georgiella Hulst, Ent. Soc. iii, 136, 1887, is a *Tineid*.

Pempelia mulleolella Hulst, Ent. Am. iii, 133, 1887, is, on the authority of Mr. Ragonot, a species of *Arta* Grt., a genus of the Pyralididæ.

Long after my MSS. were sent to the American Entomological Society for publication I received from Mr. Ragonot *separata* of the Ann. Ento. Soc. France, Bull. Séance Jan. 8, 1890, pp. vii and viii, in which he publishes descriptions of the genera *Glyptocera*, *Laodamia* and *Lætilia*, given in this paper.

He also describes the following new genus and species:

ULOPHORA n. gen.

Ann. Soc. Ento. France, Bull. Séances, p. vii, 1890.

Antennæ hardly flattened, slightly pubescent, thickened towards the base, not bent; labial palpi very long, ascending, considerably surpassing vertex, slender, acute, the third member long; maxillary palpi squamous, close against the front; tongue strong; body slender, fore wings straight, with a strong ridge of scales before the first line, the costa very straight. Fore wings 11 veins, 4 and 5 converging, separate, 10 separate; hind wings 8 veins, 8 separate, appearing stemmed with 7, 4 and 5 stemmed, 2 distant from angle, cell short.

U. groteii n. sp.—18 mm. ♂ ♀. Fore wings brownish black, the middle field (except the last fourth), the costa, the outer edge and the cross lines powdered with gray. Lines gray, standing out from the general dark color; the first oblique, reaching the middle of the inner margin; the second vertical, strongly rounded at the middle, returning upon the fold. A reddish brown, very strong ridge of erect scales is at the middle of the basal field. Discal spots distinct, oblique; hind wings shining blackish yellow, cupreous. Thorax gray, the posterior middle portion dark brick-red

North Carolina.

Dedicated to Mr. Grote. The genus may follow *Myelois* in the Catalogue. It is very close to that genus, differing in the shortness of the cell of the hind wings, and the raised scale ridge of the fore wings.

In conclusion, I express my very hearty thanks to the many who have assisted me with material for study, and to the others who as well have given me counsel and encouragement. Without belittling

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what others have done, I am especially under obligations to Henry Edwards, Prof. Fernald and Mr. E. L. Ragonot. To the first, for his generous gifts of material; to the second for no less generous gifts and for helpful counsel; to the last, for the determination and loan of material, without which this paper must have been much more incomplete than it is. I take occasion also here thank Prof. Comstock, of Cornell University, for the loan of the Plate of *Lætilia coccidivora*, which serves to give an approximate representation of all larvæ and pupæ, as well as the general shape and appearance of many of the imagines.

Catalogue of the PHYCITIDÆ of North America.

PHYCITINÆ Rag.

I. **MYELOIS** Hüb.
Oncocera Steph.
Lispe Treit.
Myelophila Treit.

1. **bistriatella** Hulst.
2. **subtetricella** Rag.
3. **immundella** Hulst.
4. **bilineatella** Rag.
5. **zonulella** Rag.
6. **obnupsella** Hulst.
7. **minutulella** Hulst.
8. **alatella** Hulst.
   rectistrigella Rag.
9. **coniella** Rag.
10. **duplipunctella** Rag.
11. **hystriculella** Hulst.

ULOPHORA* Rag.
groteii Rag.

II. **RHODOPHÆA** Gn.

12. **pallicornella** Rag.
13. **exsulella** Zell.

III. **ACROBASIS** Zell.

14. **palliolella** Rag.
    albocapitella Hulst.
15. **caryivorella** Rag.
16. **rubrifasciella** Pack.
17. **comptoniella** Hulst.
18. **betulella** Hulst.
19. **angusella** Grt.
    minimella Rag.
20. **demotella** Grt.
21. **caryæ** Grt.
22. **nigrosignella** Hulst.
23. **hebescella** Hulst.
24. **gulosella** Hulst.

IV. **MINEOLA** Hulst.

25. **tricolorella** Grt.
26. **amplexella** Rag.
27. **caliginella** Hulst.
    comptella Rag.
28. **vaccinii** Riley.
29. **indigenella** Zell.
    nebulo Walsh.
    zelatella Hulst.
    var. **nebulella** Riley.
30. **juglandis** Le Baron.

V. **PIESMOPODA** Zell.

31. **subrufella** Hulst.
32. **filiolella** Hulst.

VI. **PHYCITOPSIS** Rag.

33. **flavicornella** Rag.

* See "Notes on other Species."

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VII. DIORYCTRIA Zell.

34. aurantiacella Grt.
    miniatella Rag.
35. abietella S. V.
    decuriella Hüb.
    reniculella Grt.
    abietivorella Grt.
36. actualis Hulst.
37. clarioralis Wlk.

VIII. PINIPESTIS Grt.

38. pygmæella Rag.
39. amatella Hulst.
40. zimmermanni Grt.
41. albovittella Hulst.

IX. DASYPYGA Rag.

42. alternosquamella Rag.
    var. stictophorella Rag.

X. TACOMA Hulst.

43. feriella Hulst.

XI. PROMYLEA Rag.

44. lunigerella Rag.

XII. GLYPTOCERA Rag.

45. consobrinella Zell.

XIII. ORTHOLEPIS Rag.

46. jugosella Rag.

XIV. AMBESA Grt.
    Pristophora Rag.

47. lætella Grt.
48. niviella Hulst.
49. lallatalis Hulst.
    denticulella Rag.
50. walsinghami Rag.

XV. NEPHOPTERYX Hüb.
    Sciota Hulst.

51. pergratialis Hulst.
    grotella Rag.
52. scobiella Grt.
    decimerella Hulst.
53. furfurella Hulst.
54. ovalis Pack.
    latifasciella Pack.
    var. geminipunctella Rag.
    var. hypochalciella Rag.
55. rhypodella Hulst.
    curvatella Rag.
56. fasciolalis Hulst.
57. rubrisparsella Rag.
    rufibasella Rag.
    croceella Hulst.
58. gilvibasella Hulst.
59. basilaris Zell.
60. inquilinella Rag.
61. crassifasciella Rag.
62. subtinctella Rag.

XVI. TLASCALA Hulst.

63. reductella Wlk.
    gleditschiella Fern.
64. finitella Wlk.

XVII. MEROPTERA Grt.
    Oreana Hulst.

65. pravella Grt.
66. uvinella Rag.
67. unicolorella Hulst.
68. canescentella Hulst.

XVIII. SALEBRIA Zell.

69. pumilella Rag.
70. annulosella Rag.
71. nubiferella Rag.
72. tenebrosella Hulst.
    quercicolella Rag.
73. semiobscurella Hulst.
74. subfuscella Rag.
75. contatella Grt.
    var. quinquepunctella Grt.
76. celtidella Hulst.
77. tarmitalis Hulst.
78. delassalis Hulst.
    fernaldi Rag.
79. carneella Hulst.
80. bifasciella Hulst.
81. aliculella Hulst.
    oberthuriella Rag.
82. odiosella Hulst.

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XIX. LAODAMIA Rag.

83. fusca Haw.
posticata Zett.
janthinella Dup.
mæstella Wlk.
undulatella Wlk.
frigidella Pack.
cacabella Hulst.

XX. ELASMOPALPUS Blanch.

84. melanellus Hulst.
85. petrellus Zell.
erectalis Wlk.
rufinalis Wlk.
hapsella Hulst.
obsipella Hulst.
86. decorellus Wlk.
metagrammalis Wlk.
87. floridellus Hulst.
88. lignosellus Zell.
angustellus Blanch.
var. incautellus Zell.
var. tartarellus Zell.
carbonella Hulst.

XXI. SELAGIA Zell.

89. lithosella Rag.

XXII. ANORISTIA Rag.

90. flavidorsella Rag.
91. olivella Hulst.

XXIII. PYLA Grt.

92. scintillans* Grt.
93. æneoviridella Rag.

XXIV. EPISCHNIA Hüb.

94. ruderella Rag.
95. granitella Rag.
96. boisduvaliella Gn.
farrella Curt.
lafauriella Const.
97. albocostalis Hulst.
98. subcostella Rag.
99. fulvirugella Rag.

XXV. PIMA Hulst.

100. albiplagiatella Pack.
fosterella Hulst.

XXVI. MEGASIS Gn.

101. edwardsialis Hulst.
polyphemella Rag.
102. excantalis Hulst.
pullatella Rag.
103. atrella Hulst.

XXVII. LIPOGRAPHIS Rag.

104. fenestrella Pack.
var. leoninella Pack.
105. humilis Rag.

XXVIII. HYPOCHALCIA Hüb.

106. hulstiella Rag.

XXIX. SARATA Rag.

107. nigrifasciella Rag.
108. perfuscalis Hulst.
dophnerella Rag.

XXX. ETIELLA Zell.
Ramphodes Gn.
Mella Wlk.

109. zinckenella Treits.
etiella Treits.
dymnusalis Wlk.
110. shisticolor Zell.
villosella Hulst.
111. rubribasella Hulst.

XXXI. MELITARA Wlk.
Megaphycis Grt.

112. prodenialis Wlk.
bollii Zell.
113. dentata Grt.
114. fernaldialis Hulst.

XXXII. ZOPHODIA Hüb.
Dakruma Grt.

115. grossulariæ Pack.
turbatella Grt.
116. graciella Hulst.
117. packardiella Rag.
118. glaucatella Rag.
119. dilatifasciella Rag.

XXXIII. EUZOPHERA Zell.
Stenoptycha Von Hein.
Melia Von Hein.

* This name is printed in error scintallans on p. 161.

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120. ostricolorella Hulst.
121. semifuneralis Wlk.
impletella Zell.
pallulella Hulst.
122. nigricantella Rag.
123. agleella Rag.
124. ochrifrontella Zell.
ferruginella Rag.
125. franconiella Hulst.

XXXIV. SENECA Hulst.

126. tumidulella Rag.

XXXV. VITULA Rag.

127. edmandsii Pack.
dentosella Rag.
128. serratilineella Rag.
129. basimaculella Rag.

XXXVI. CANARSIA Hulst.

130. ulmiarrosorella Clem.
pneumatella Hulst.
ulmella Rag.
fuscatella Hulst.
131. hammondi Riley.

XXXVII. LÆTILIA Rag.

132. coccidivora Comst.
pallida Comst.
133. ephestiella Rag.

XXXVIII. STAUDINGERIA Rag.

134. albipennella Hulst.

XXXIX. HETEROGRAPHIS Rag.
Mona Hulst.

135. morrisonella Rag.
var. coloradensis Rag.
var. olbiella Hulst.

XL. HONORA Grt.

136. oblitella var. undulatella Clem.
propriella Wlk.
137. mellinella Grt.
138. ochrimaculella Rag.
139. sciurella Rag.
140. subsciurella Rag.
141. montinatatella Hulst.
canicostella Rag.

XLI. DIVIANA Rag.

142. eudoriella Rag.

XLII. DOLICHORRHINIA Rag.
Macrorrhinia Rag.

143. aureofasciella Rag.

XLIII. HOMŒOSOMA Curt.
Phycidea Zell.

144. impressalis Hulst.
145. uncanalis Hulst.
146. anguliferella Rag.
147. albescentella Rag.
148. illuvella Rag.
candidella Hulst.
149. opalescella Hulst.
tenuipunctella Rag.
150. electella Hulst.
texanella Rag.
151. stypticella Grt.
152. mucidella Rag.

XLIV. MOODNA Hulst.

153. pelviculella Hulst.

XLV. EPHESTIODES Rag.

154. gilvescentella Rag.
155. infimella Rag.
156. erythrella Rag.

XLVI. EURYTHMIA Rag.

157. hospitella Zell.
quantulella Hulst.
158. ignidorsella Rag.

XLVII. MANHATTA Hulst.
Hornigia Rag.

159. obtusangulella Rag.
160. lugubrella Rag.

XLVIII. UNADILLA Hulst.

161. nasutella Hulst.

XLIX. EPHESTIA Guen.

162. rileyella Rag.
163. fuscofasciella Rag.
164. kuehniella Zell.
165. nigrella Hulst.
166. elutella Hüb.

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L. PLODIA Guen.

167. interpunctella Hüb.

LI. BANDERA Rag.

168. binotella Zell.

169. subluteella Rag.

170. cupidinella Hulst.

LII. TAMPA Rag.

171. dimediatella Rag.

PEORIINÆ Hulst.

LIII. RAGONOTIA Grt.

Ciris Rag.

172. dotalis Hulst.

discigerella Rag.

173. saganella Hulst.

LIV. MARICOPA Hulst.

174. lattivittella Rag.

LV. VOLUSIA Hulst.

175. roseopennella Hulst.

LVI. ALTOONA Hulst.

176. opacella Hulst.

177. dichrœella Rag.

178. tetradella Zell.

179. ardiferella Hulst.

LVII. CAYUGA Hulst.

180. gemmatella Hulst.

181. bistriatella Hulst.

LVIII. MARTIA Rag.

182. arizonella Rag.

LIX. AURORA Rag.

183. longipalpella Rag.

LX. ATASCOSA Hulst.

184. bicolorella Hulst.

185. floscella Hulst.

LXI. SALURIA Rag.

186. rostrella Rag.

187. ostreella Rag.

188. glareosella Zell.

LXII. NAVASOTA Rag.

189. hebetella Rag.

LXIII. HYPSOTROPA Zell.

190. luteicostella Rag.

LXIV. DANNEMORA Hulst.

191. edentella Hulst.

LXV. PEORIA Rag.

192. hæmatica Zell.

roseatella Pack.

193. bipartitella Rag.

LXVI. HOMOSASSA Hulst.

194. ella Hulst.

LXVII. WEKIVA Hulst.

195. nodosella Hulst.

LXVIII. PETALUMA Hulst.

196. illibella Hulst.

puricostella Rag.

197. inspergella Rag.

LXIX. STATINA Rag.

198. roseotinctella Rag.

199. gaudiella Hulst.

LXX. CALERA Rag.

200. punctilimbella Rag.

LXXI. CŒNOCHROA Rag.

201. californiella Rag.

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EXPLANATION OF PLATE VI.

Fig. 1.—Palpus of *Dolichorrhinia aureofasciella* Rag.
" 2.— " of *Euzophera semifuneralis* Walk.
" 3.—Head of *Acrobasis comptoniella* Hulst.
" 4.— " of *Pima albiplagiatella* Pack.
" 5.— " of *Petaluma illibella* Hulst.
" 6.—Maxillary palpus of *Laodamia fusca* Haw. ♂.
" 7.—Antenna of *Tacoma feriella* Hulst ♂.
" 8.— " of *Elasmopalpus lignosellus* Zell. ♂.
" 9.— " of *Peoria hæmatica* Zell. ♂.
" 10.— " of *Etiella zinckenella* Treit. ♂.
" 11.— " of *Pima albiplagiatella* Pack. ♂.
" 12.— " of *Acrobasis comptoniella* Hulst ♂.

———o———

EXPLANATION OF PLATE VII.

Fig. 13.—Tufts on last segment below of *Pima albiplagiatella* Pack. ♂.
" 14.—Uncus of *Acrobasis comptoniella* Hulst ♂.
" 15.— " of *Bandera cupidinella* Hulst ♂.
" 16.— " of *Staudingeria albipennella* Hulst ♂.
" 17.—Harpe of *Elasmopalpus lignosellus* Zell. ♂.
" 18.— " of *Eurythmia hospitella* Zell. ♂.
" 19.— " of *Epischnia boisduvaliella* Gn. ♂.
" 20.—Lower plate of *Acrobasis comptoniella* Hulst ♂.
" 21.— " of *Plodia interpunctella* Hüb. ♂.
" 22.—Uncus of *Peoria hæmatica* Zell. ♂.
" 23.—Harpe of *Elasmopalpus petrellus* Zell. ♂.

———o———

EXPLANATION OF PLATE VIII.

Fig. 24.—Venation, fore wing *Pyla scintillans* Grt.
" 25.— " hind wing " "
" 26.— " fore wing *Zophodia grossulariæ* Pack.
" 27.— " hind wing " "
" 28.— " fore wing *Petaluma illibella* Hulst.
" 29.— " hind wing " "
" 30.— " fore wing *Statina roseotinctella* Rag.
" 31.— " hind wing " "
" 32.— " fore wing *Eurythmia hospitella* Zell.
" 33.— " hind wing " "
" 34.— " fore wing *Plodia interpunctella* Hüb.
" 35.— " hind wing " "

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MAR 3 1897

A Synopsis of the Odonat Genus LEUCORHINIA Britt

BY DR. H. A. HAGEN.*

[The genus *Leucorhinia* was first characterized by C. C. Brittinger in 1850, as follows:

The following species, which, by the metallic lustre of the upper surface of their body, by the form, dorsal flanks and appendages of the abdomen, by a triangular black spot on the base of the hind wings, and by their white frons and nasus, form a very natural group, I have already separated in 1845, as a distinct genus under this name. (Translated from Sitzungsber. Akad. Wissenschaft. Wien, 1850, Bd. iv, p. 333.)

The "following species" are: 1. *rubicunda* Linn.; 2. *pectoralis* Charp.; 3. *dubia* Vander Lind.; 4. *albifrons* Burm.; 5. *caudalis* Charp.; 6. *ornata* Britt. (= *caudalis* Charp.)

Dr. Brauer in his *Verzeichniss der bis jetzt bekannten Neuropteren im Sinne Linne's*, Zweiter Abschnitt (Verhdl. k. k. zool.-bot. Gesell. Wien, xviii, pp. 711–742, 1868) places the genus *Leucorhinia* in the "Fourth Group" of the "Tribus Libellulina." This fourth Group is characterized by having

The costal margin on the basal side of the nodus entire, suture between the eyes short, triangles equally placed, *i. e.* those of the hind wings reaching as far outwards as the middle cell† of the forewings.

The genus *Leucorhinia* belongs to the second section of the fourth group, which section includes those

Species with heart-shaped, almost entirely four-sided hind margin of the prothorax, notched or broadly bilobed on the free margin; only one, or at the most two (then mostly unsymmetrical) cross veins in the middle cell. The triangle of the hindwings reaches as far outwards as the end of the middle cell in the forewings. Both triangles normal (*i. e.* the anterior side not broken). Vulva mostly covered, when open the last segments are very short; hamules always bifid. Eyes always united for a short distance. Claws with a tooth.

Lastly the genus *Leucorhinia* is itself characterized as follows:

Sectors of the arculus arising separated from a point. Hindwings broader at the base. Membranule distinct. Triangle moderately wide. Reticulation otherwise as in *Diplax*. Less than ten antecubitals; 2–3 discoidal rows. Lobe of prothorax large, broad, bilobed. Abdomen slender, somewhat shorter than the wings, more or less widened in the male, somewhat thicker at the base. Genitalia little prominent, vulva covered, the valve often shrunken. Sides of the eighth segment not widened.

Dr. Brauer included in *Leucorhinia* the following species: *pectoralis, dubia, rubicunda, albifrons, caudalis, intacta, hudsonica, elisa* Hag., *amanda* Hag., *ornata* Ramb. and 2 sp. Ind. Orient.

* In February, 1890, Dr. Hagen sent me the MS. of this paper and the accompanying figures (see Pl. x) with permission to publish the same. With his consent, I have made some additions to his paper. These are enclosed in brackets [], and for them I alone am responsible.—Philip P. Calvert.

† Median space, espace médian, lower basal cell, of other authors.

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Dr. Hagen, in the "Synopsis of the Odonata of America" (Proc. Bost. Soc. Nat. Hist. xviii, pp. 20–96, 1875) referred *elisa* to *Celithemis* (as previously indicated by Walsh), and *amanda* and *ornata* to *Diplax*.

Mr. W. F. Kirby, in his "Revision of the Subfamily Libellulina" (Trans. Zoöl. Soc. London, xii, part 9, pp. 249–348, pls. li–lvii, 1889), places *elisa*, *amanda* and *ornata* in *Celithemis; albifrons*, *pectoralis*, *dubia*, *rubicunda*, *hudsonica* and *intacta* in *Leucorhinia*, and *caudalis* in *Cœnotiata* (Buch.)

The genus *Leucorhinia* as here understood, is equivalent to the combined genera *Leucorhinia* and *Cœnotiata* of Kirby, or to the *Leucorhinia* of Brauer with the omission of the species *elisa et seq.*]

Pl. x, fig. 8, shows the right hamulus of *intacta* drawn from below, the insect turned over. The whole part in the middle, *m*, is pale membranaceous, and in *rubicunda* is often inflated. The branch *a* is movable, and is always entirely shut down when the penis is visible between the two hamuli of the right and left sides. This arrangement of the hamulus, which is indeed rather peculiar, is a character of the genus *Leucorhinia*, and excludes the species put in by Dr. Brauer (*elisa et seq.*). The anterior branch of the hamules, *a*, is represented in *á*, as seen from the side, and is apparently very different.

[*Elisa*, *amanda* and *ornata* differ from the other species also by having the pterostigma proportionately longer and narrower; in *elisa* and *amanda* the last antecubital (antenodal) of the forewings is not continuous.

The genus *Leucorhinia* thus defined comprises eleven known species, viz.: 1. *triedra* Müll. (*caudalis* Charp.) 2. *albifrons* Burm.; 3. *frigida* Hag.; 4. *pectoralis* Charp.; 5. *borealis* Hag.; 6. *rubicunda* Linn.; 7. *proxima* (Hag. MS.) Calvert; 8. *hudsonica* Selys; 9. *dubia* Vander Linden; 10. *glacialis* Hag.; 11. *intacta* Hag.]

1. **Leucorhinia triedra** Müller.

[Northern, Eastern and Central Europe.—Selys.*]

I am convinced that for *caudalis* Charp. the name *triedra* Müller should be accepted. In 1850, neither Baron de Selys nor I had studied Müller's work thoroughly, and I at least did not know the varieties of *caudalis* as well as in later times. Müller's description (Nova Acta Nat. Curios., iii, p. 129) agrees entirely with all the varieties and cannot be applied to any other species. The only ob-

* The geographical distribution of the European species is, according to Baron de Selys-Longchamps' *Odonates de l'Asie Mineure et Revision de ceux des autres parties de la Faune dite Européenne* (Ann. Soc. Ent. Belg., xxxi, pp. 1–85, 1887), p. 75.—P. P. C.

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jection we can make against the name *triedra* is that we have been accustomed for fifty years to *caudalis*—from not having studied Müller's work.

2. **Leucorhinia albifrons** Burmeister.

[Northern and Eastern Europe; Switzerland; Vosges Mountains. —Selys.]

3. **Leucorhinia frigida** n. sp.

Hagen, Proc. Bost. Soc. Nat. Hist. xviii, p. 79, 1875 (no description).

♂ ♀ Massachusetts; ♂ N. Red River, British America; Ontario; Dakota. This is the smallest species except *hudsonica*, and seems to be rare.

Length 30 mm. Alar expanse 45 mm. Pterostigma 1.5 mm. Abdomen 19 mm. Inferior wing 22 mm.

♂.—Front white, labrum yellowish white, labium black, vertex and occiput black; head behind and thorax with whitish hairs; thorax pale olive-brown, with two black spots near the legs, but much darker in the adult male. Abdomen of the form of *albifrons*, black; segments 1-3 pale olive-brown, except the extreme apex of 3; the basal half of dorsal suture of 6 and 7 with a narrow yellow stripe; adult male with segments 1-4 entirely covered by bluish white powder. Legs black.

Superior appendages black, pointed, with about five tubercles below (Pl. x, fig. 7). Inferior appendage black, elongated, narrowed to tip, a little emarginate (Pl. x, fig. 2). Hamulus wide open, basal branch thin, directed backwards.

Wings hyaline, venation black, costa and some parts after pterostigma yellowish. Anterior wings with a very small black basal spot in subcostal and median spaces; posterior wings with similar spots, but larger, the one in the median space sending a branch along the border of the wing to form a triangular spot, which is emarginate (Pl. x, fig. 17). One male has the wings a little yellowish at base. Pterostigma oblong, brown, a little paler on both sides; 7 antecubitals, 7 postcubitals.

♀.—Similar; labium white on both sides; abdomen broader, segment 2 above with a large, round, yellow spot, 4-8 with dorsal spots narrowing behind, the last three only short, narrow bands. Appendages black. Vulvar lamina half as long as the 9th segment, bifid to base, valves sharply pointed (Pl. x, fig. 20).

This species differs from the others by: first, its small size; second, the more elongated pterostigma; third, the inferior appendage of the ♂ and the vulva of the ♀. I think I have seen more specimens, and from other States, but the numerous faunal lists are not yet tabulated.

4. **Leucorhinia pectoralis** Charpentier.

[Northern and Central Europe.—Selys.]

5. **Leucorhinia borealis** n. sp.

Hagen, Proc. Bost. Soc. Nat. Hist., xviii, p. 78, 1875 (no description).

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Six males and four females from Saskatchewan River and Fort Resolution, Hudson's Bay Territory by Kennicott. Abdomen 27 mm. Hindwing 30 mm.

This species is intermediate between *pectoralis* and *rubicunda*. Of *pectoralis* it has the stature, the somewhat brighter colors, and the vulva of the female. Otherwise it is decidedly very near to *rubicunda* by the wings and the thinner abdomen. Pl. x, fig. 10, shows the hamulus, viewed from the side. In *rubicunda* the membrane *m* is inflated in lifetime, and in some specimens after death. This shape is figured by me in the "Revue des Odonates" Pl. I. I have not seen such inflation in the other four European species even when alive. All my figures represent the hamulus opened, as it is when no copulation is in progress,—the regular position. But as I stated before, the basal branch (I have marked the articulation) can be shut in just as the blade of a pocket-knife. I have, for comparison, given the figure (Pl. x, fig. 11) of the hamulus of *rubicunda* when the membrane is *not* inflated.

The "pièce antérieure" of *borealis* is similar to that of *rubicunda;* the long pointed brush of hairs, always present in *pectoralis*, is wanting in *borealis*. The vulva of the female (Pl. x, fig. 21) decides the difference between *borealis* and *rubicunda*. But there is another difference: *borealis*, both male and female, has always a large red spot on the dorsum of the eighth abdominal segment, just as on the seventh and preceding segments. *Rubicunda* and *pectoralis* never have this spot.

6. **Leucorhinia rubicunda** Linné.

[Northern and Central Europe; Northern Asia.—Selys.]

I have again compared the male *rubicunda* from Wilni, Siberia. As I have stated long ago, I find no difference, except the shape of the inferior appendage (Pl. x, fig. 5), which may be after all a different variety.

7. **Leucorhinia proxima** (Hagen MS.) Calvert.

[Hagen, Proc. Bost. Soc. Nat. Hist. xviii, p. 79, 1875 (no description). Calvert, Trans. Amer. Ent. Soc. xvii, p. 38, pl. v, figs. 5, 6, 1890. *Leucorhinia perversa* Hagen, MS.

I have described only the male, my types being from Manchester, Kennebec County, Me., and Pictou, Nova Scotia. Dr. Hagen's types of *perversa*, at one time supposed by him to be a distinct species, were three males from Cape Breton, Nova Scotia, and one male from Massachusetts. In 1875, Dr. Hagen also indicated *proxima* from the White Mountains of New Hampshire.]

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Three males, one from British America, high up, the others from Victoria, Vancouver's Island. Abdomen 21–62 mm., hindwing 25–27 mm.

This species is near to *rubicunda*.

All three males with labium entirely black. Abdomen a little covered with whitish blue powder, on the under side only; segment 2 with a large rounded yellowish dorsal spot; 3 yellow to the suture, and a narrower yellowish spot beneath the suture; dorsal crest of 4 and 7 with a faint yellowish line (Pl. x, fig. 1).

I have looked through my whole collection for the female, and I believe that three females from Loon Lake, Colvillo Valley, State of Washington, collected by myself July 23, 1882, belong to this species. This locality is just as far off from Vancouver Island and from the border of British America. I caught together with them one ♀ of *intacta*, very easily to be recognized by the vulva.

♀.—Abdomen 22 mm., hindwing 24 mm., pterostigma 2 mm. (a little longer than in the ♂).

Labium, its lobes and labrum, black. Abdomen having segment 2 with a large, round, yellow spot, sides below yellow; segment 3 yellow to suture, and a smaller spot after suture; 4–7 with a narrow yellow dorsal band on the basal half of crest. Appendages black. Vulva with two short approximated tubercles (Pl. x, fig. 22) (similar to *L. rubicunda*). Wings as in the male.

8. **Leucorhinia hudsonica** Selys.

[*Libellula hudsonica* Selys, Revue des Odonates, p. 53, 1850.

Diplax hudsonica Hagen, Syn. Neur. N. Am., p. 180, 1861.

Leucorhinia hudsonica Hagen, Proc. Bost. Soc. Nat. Hist., xviii, p. 78, 1875.

Leucorhinia Hogeni Calvert, Trans. Amer. Ent. Soc. xvii, p. 36, pl. v, figs. 2, 3, 4, 10, 1890. Ent. News, I, p. 73, 1890.]

Lake Winnipeg; Saskatchewan River and Ft. Resolution, Hudson Bay Territory; Massachusetts; [Pictou, Nova Scotia.]

I have tried to make a thorough study of *hudsonica* and *dubia*. Of the first, I have before me fourteen specimens, of the latter thirty-seven. The size of both species varies.

The specimens of *dubia* are usually larger, except one female from Braunsberg, East Prussia, whose hindwing is 22 mm. long. *Hudsonica* has the hindwing 20–24 mm., abdomen 20 mm.

At first I thought that the form of the valves of the female, "presque quadrangulaires, rapprochés," in *dubia* was deciding; but a careful study of the seventeen females shows a remarkable difference in dead, *dry* specimens. I have never had more than one live specimen in my hands and it was somewhat young. It is the same which I have figured and described, and it is still before me. It is from Gilgenau, East Prussia (Pl. x, fig. 19A), and it *agrees with my*

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figure and description; one specimen from Umea (fig. 19D) is similar. The next to it is the specimen from Luneburg (fig. 19C). All the others show the valves to be more or less shrunken, or bent, or separated, especially in the Kiel specimen (fig. 19B). Now, there can be no doubt that all these different forms (see Pl. x, fig. 19) are the consequence of the shrinking after death; and they may also result even when the females have copulated and *deposited the eggs*, as I have ascertained in several specimens.

My first figure of the valvules of *hudsonica* (fig. 18A) is to be compared with the first of *dubia* "lobes rapprochés, oblonges, tronques au bout obliquement (fig. 19A)," the second (fig. 18B) to the last ones of *dubia*.

The hamules of both species are similar, but to be separated by the black, polished, triangular projection, *x*, triangular in *dubia* (fig. 12), narrower at base and larger on tip in *hudsonica* (fig. 13).

The appendages of the males of the two species differ. *Dubia* has the inferior appendage only half as long as the superiors, the tip of which is crenated. *Hudsonica* has the inferior appendage proportionately longer, reaching the obliquely truncated inferior tip of the superiors.

The pattern and coloring of the two species vary much, but *hudsonica* has in some specimens of both sexes a spot on the 8th abdominal segment, which I never saw in *dubia*. The color of the labium varies much in *hudsonica*, in so far as the external margin, in the female, is pale and sometimes connected with a large white spot, as in the male.

I think *hudsonica* can be retained as a different species.

9. **Leucorhinia dubia** Vander Linden.

[Northern and Central Europe.—Selys.]

10. **Leucorhinia glacialis** n. sp.

[Hagen, Proc. Bost. Soc. Nat. Hist., xviii, p. 79, 1875. No description.]

This species is related to *intacta*. I have sixteen males before me from Massachusetts; Cape Breton, Nova Scotia; London, Ontario; Michipicoten on Lake Superior; and Reno, Nevada (Mr. Morrison, 1878). [Elsewhere in his MS. Dr. Hagen refers to a male *glacialis* from the White Mts. of New Hampshire, collected by Morrison.]

♂.—Abdomen 23–25 mm. Hindwing 24–27 mm.

Labrum milk-white; labium and lobes black; thorax with a large yellow band, sometimes contracted after base. Wings as in *intacta*. Abdomen black, segment 2, and 3 to suture and a triangular spot after suture, yellowish brown; no spots or lines on 7 or 8; one specimen just out of the nymph, its colors not yet finished,

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has on the dorsal crest at the base of 7 and 8, a small yellowish streak. Appendages similar, inferior (Pl. x, fig. 3) as in *proxima*. Pl. x, fig. 14, shows side view of hamulus; the end *b* with strong bristles. The "piéce anterieure" is without any tubercles.

I do not know the female. The only female from Reno belongs to *intacta?*

11. **Leucorhinia intacta** Hagen.

[*Diplax intacta* Hagen, Syn. Neur. N. Am. p. 179, 1861.
Walsh, Proc. Acad. Phila., 1862, p. 400.
Leucorhinia intacta Hagen, Proc. Bost. Soc. Nat. Hist., xviii, p. 78, 1875.
Calvert, Trans. Amer. Ent. Soc. xvii, p. 39, pl. v, figs. 1, 7, 8, 9, 1890.]

Canada; Maine; Massachusetts; [Pennsylvania]; Ohio; Illinois; Michigan; Wisconsin; [South Dakota]; Nevada; Washington (State).

This species varies much in size and color.

Among the forty-seven males just carefully examined, the labium is entirely black *only in five specimens*. It is more or less white in the other forty-two specimens. In one-third of these forty-two the labium is black with the external half of the lobes white (Pl. x, fig. 15A) in another third, only the apical half of the external half of the lobes is white (fig. 15B); in the remaining third the white spot is smaller, usually not reaching the tip of the lobe (fig. 15C), and less well defined, sometimes even to be recognized with difficulty. The five males with black labia are all from different localities, East or West, or Middle States, and from the same localities with the white-marked ones. I collected in Massachusetts, on the same day and at the same place, males with entirely dark labia and also those with the outer half of the lobe white. Further, the black ones do *not* belong to *older* specimens. Indeed, the half white ones are as old as the others. But the young males with colors not yet complete, have labium and lobes pale throughout.

The labrum is white, but sometimes more or less blackish in the middle.

On the abdomen, even of very dark males, a twin yellow spot is usually visible on segment 7.

Inferior appendage of the male widely emarginate, bifid (fig. 6); it varies much, as it is more or less emarginate, its branches more or less diverging and more or less pointed (I had formerly called such an exaggerated form *L. spilosa*).

The male has on each side of the "piéce anterieure" of the second segment [anterior lamina], *an oval, elevated, black tubercule, flat, en-*

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tirely covered with black spines, which character separates this species from all others (fig. 16).

Length of abdomen of the male 20–24 mm., hindwing 21–29 mm. The average dimensions of Massachusetts specimens are *mostly* near the smaller numbers, of the Western specimens near the larger.

Vulva with two distant lobes, and behind them two accessory palps in the middle of the segment (fig. 23).

The basal spot on hind wing is small and emarginate below; all the others are only beginning (seen with strong lens). The wings of the female vary much more, the triangular spot on hindwings is sometimes larger, also in subcostal space, and in the forewings more or less long, sometimes divided into two transversal spots, the wings sometimes yellow to triangle or farther, and sometimes smoky.

This species is the most common of its genus in the Northern parts of the United States. I have not seen it, however, from the Colorado Mountains where *Diplax scotica* flies.

———o———

I possess the nymphæ of *pectoralis* and *triedra* raised by myself, and of *dubia* raised by Heyer. The nympha of *triedra* differs from the others and is nearer to *Cordulia*. The descriptions are not yet published. I think that I have also the nympha of *intacta*.

EXPLANATION OF PLATE X.

Fig. 1.—Pattern of coloring of abdomen of *Leucorhinia proxima*.
" 2.—Inferior appendage of *L. frigida* ♂; 2A, its tip.
" 3.— " of *L. glacialis* ♂.
" 4.— " of *L. proxima* ♂.
" 5.— " of *L. rubicunda* ♂ from Wilni, Siberia.
" 6.— " of *L. intacta* ♂.
" 7.—Appendages of *L. frigida* ♂, viewed from the side.
" 8.—Hamule of *L. intacta* ♂, viewed from below.
" 9.— " of *L. proxima* ♂ (form *perversa*), viewed from below.
" 10.— " of *L. borealis* ♂, viewed from the side.
" 11.— " of *L. rubicunda* ♂, viewed from the side.
" 12.— " of *L. dubia* ♂, viewed from the side.
" 13.— " of *L. hudsonica* ♂, viewed from the side.
" 14.— " of *L. glacialis* ♂, viewed from the side.
" 15.—*A, B, C.* Three patterns of coloring of labium of *L. intacta* ♂.
" 16.—Tubercules on the "piéce anterieure" of *L. intacta* ♂.
" 17.—Base of hindwing of *L. frigida*.
" 18.—*A, B.* Valves of *L. hudsonica* ♀.
" 19.—*A–F.* " of *L. dubia* ♀.
" 20.— " of *L. frigida* ♀.
" 21.— " of *L. borealis* ♀.
" 22.— " of *L. proxima* ♀.
" 23.— " of *L. intacta* ♀.

a, basal branch of hamule.
b, apical branch of hamule.
art, articulation of basal branch.
m, membrane lining the hamule.
x, triangular polished projection.
á, (figs. 8, 9) basal branch of hamule, separated and viewed from side

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Notes on some HYDROBIINI of Boreal America.

BY GEO. H. HORN, M. D.

The genera and species of this tribe, as far as they were then know to me, were made the subject of a study and the results published in Proceedings Amer. Philos. Soc. 1873, pp. 118–137. The basis of this work was furnished by the collection of Dr. LeConte, together with my own, so that the species were represented in most cases by fair series of specimens with very few uniques. Since that time but three species have been described, although numerous collections have been made, adding greatly to our series of those known.

In the generic division, adopted in the above-mentioned paper, a very conservative course was followed, and only those genera which had received the sanction of Lacordaire and the authors of the "Catalogus" were recognized. Numerous subdivisions of Hydrobius and Philydrus had been proposed, notably by Mulsant and Thomson, which were not viewed with much favor at the time of my essay. In 1870 (Ent. Mo. Mag. p. 373), Dr. Sharp added to our knowledge of some of these genera by amplifying the diagnoses and illustrating them by some well executed detail sketches drawn by Mr. Rye, although he did not at the time seem to have a thorough conviction of the validity of the greater number of them.

In 1881, Mr. Bedel (Faune du Bassin de la Seine) admits the validity of Paracymus and Anacæna of Thomson, and Helochares of Mulsant, at the same time suggesting two new genera: Crenitis, separated from Hydrobius and Cymbiodyta from Philydrus.

More recently Dr. Sharp has studied the species of the Central American fauna (Biol. Cent. Am. 1, 2) with the result of adding Metacymus, Sindolus, Chasmogenus and Hydrocombus, the first being related to the small Hydrobius forms, the last three to Philydrus. He has not admitted any of the genera into which Hydrobius had been divided.

The object of the present paper is to give the the results of a study of the species in our fauna in their relation to the genera which have been proposed by the various authors above cited and at the same time it is hoped to define the species more sharply by the important aid afforded by vastly increased material and the discovery in them of sexual characters which have proven of great utility.

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The tribe Hydrobiini has been restricted by Bedel to Laccobius, Philydrus and Hydrobius, together with any subdivisions of the last two. Helopeltis may be removed by the form of the head (Pl. iv, fig. 21) and concealed labrum. Dr. Sharp observes that the anterior coxal cavities are closed behind, while in the other genera they are open.

The present study is practically narrowed to the species formerly considered by me as belonging to Philydrus and Hydrobius, and as any genera which follow are dismemberments from these, the discussion is best begun by giving the characters separating them:

Terminal joint of maxillary palpus rarely as long, usually shorter than the preceding joint.....PHILYDRUS.
Terminal joint of maxillary palpus always longer than the preceding joint. HYDROBIUS.

It will be observed in all the species of Hydrobius as above defined, that the terminal joint of the maxillary palpus always bends inward toward the other joints and in the same plane as is usual with palpi generally, but in Philydrus the terminal joint is so articulated that it bends downward as well, and is less inclined to bend toward the mouth.

The aggregate above separated as Philydrus has been divided into six parts, defined by the following characters, which, for convenience, are reduced to a tabular form.

Tarsi 5-jointed on all the feet.....2.
Tarsi 4-jointed on the middle and hind feet.....4.
2.—Second joint of maxillary palpi* curved with the convexity to the front; mesosternum laminate.....PHILYDRUS.
Second joint curved with the convexity posterior.....3.
3.—Mentum with anterior border entire; mesosternum with median longitudinal lamina; elytra without sutural stria.....SINDOLUS.
Mentum with a slight notch† at middle; mesosternum not carinate; elytra striate or not.....HELOCHARES.
Mentum regularly impressed at middle, the middle of the anterior border deeply semicircularly emarginate; mesosternum prominent in a longitudinal manner along the middle; sutural stria distinct..CHASMOGENUS.
4.—Mesosternum with a slight transverse elevation, a little in front of the coxæ; prothorax without basal marginal line; elytra with sutural stria. HYDROCOMBUS.
Mesosternum longitudinally carinate; prothorax without basal marginal line; elytra with sutural stria.....CYMBIODYTA.

* Called for convenience in the subsequent pages "pseudo-basal joint."

† "But the structure of the neighboring parts renders this character very difficult of verification (Sharp, Biol. i, 2, p. 74)."

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In the preceding table all those characters have been introduced which seem to have been deemed of importance by Dr. Sharp or Mr. Bedel, the object of the tabular arrangement being to avoid unnecessary repetition and to render the genera more easily comprehensible in their mutual relations.

To the acute observation of Dr. Sharp we owe the discovery of two really important characters—the structure of the tarsi and the form of the pseudo-basal joint of the maxillary palpi.

In all the members of the tribe Hydrobiini the first joint of the middle and hind tarsi is very short and not easily observed, but in two of the above genera the first joint has entirely disappeared, having, doubtless, become completely fused with the second without trace of suture.

The curving of the pseudo-basal joint of the maxillary palpus with the convexity forward in Philydrus and the reverse in other genera, is a well marked character of great utility after those species are removed from consideration which have heteromerous tarsi, as in several Cymbiodyta that joint is quite straight.

The genus *Philydrus* as limited above, seems to be a very homogeneous assemblage of species, all of them having a well marked mesosternal lamina (with exception of *ochraceus*), while several have the prosternum more or less carinate. It is well to observe here that Philydrus is the only genus with a well marked mesosternal lamina, as in all the other genera in which a mesosternal prominence exists the form is traceable in its derivation to a transverse ridge (Pl. iii, fig. 18).

Philydrus is the most numerously represented genus in our fauna and contains all those referred to it in my former paper, excepting those hereafter mentioned.

Sindolus Sharp is not represented in our fauna.

Helochares Muls., as restricted by Sharp and Bedel, is represented by *maculicollis*.

Chasmogenus Sharp, with the mesosternum merely protuberant and the mentum semicircularly emarginate in front, is represented by *normatus*, in which, however, the emargination of the mentum is rather less than the description of Dr. Sharp indicates, and there is no smooth submental area. The prominence of the mesosternum is variable, individually, as has been observed by Dr. Sharp, in some being merely an obtuse protuberance, in others quite acute, so that, as he observes, there is really a rudiment of a lamina. Notwith-

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standing the fact that our species possesses the essential characters of Chasmogenus, even to its manner of mesosternal variation, I am disposed to place it with Helochares, the more so as it resembles very closely the species already placed there. While I am not prepared to say that Chasmogenus should be suppressed (not having seen a typical species), I am rather disinclined to admit the name in our fauna for a species which has all its essential characters.

The genera which follow in the table, *Cymbiodyta* and *Hydrocombus*, are well separated from the others by the 4-jointed middle and hind tarsi. These two genera are said to differ in the structure of the mesosternum. To Dr. Sharp I am indebted for the species typical of Cymbiodyta (*marginella* Fab.), although Bedel includes *fimbriata* in it. An examination of our species and *marginella* shows plainly what has already been indicated, that all the forms of mesosternal protuberance, except in Philydrus are derivations from a transverse ridge. In our fauna the simplest form is seen in *lacustris*, from which the ridge first becomes longer, then arched, then elevated in its middle, so that when viewed directly from behind the ridge is in form like Λ, the entire elevation being somewhat pyramidal in form. These variations are illustrated on Pl. iii, fig. 18, *a*, *b*, *c*, *d*, *e*. I have, therefore, no hesitation in asserting that *Hydrocombus* cannot be separated from *Cymbiodyta*. To *Cymbiodyta* should be referred all those species formerly placed by me in *Helochares*, except *maculicollis*.

On the other hand one of our species with the tarsal structure of Cymbiodyta cannot be referred to it. The mesosternum in front of the coxæ is elevated in a rather slender, compressed conical process, and the claws are abruptly dilated in the male at base, less in female. The palpi are also very long and slender. For the species *bifidus* Lec. I propose the generic name Helocombus.

The genera which are known to occur in our fauna and seem entitled to recognition are as follows:

Tarsi 5-jointed on all the feet.

Pseudo-basal joint of maxillary palpus curved with the convexity anteriorly; mesosternum with a longitudinal lamina; tarsal claws toothed in male with few exceptions..... **Philydrus.**

Pseudo-basal joint curved with the convexity posteriorly; mesosternum, at most, feebly protuberant; tarsal claws simple..... **Helochares.**

Tarsi 4-jointed on the middle and posterior feet; pseudo-basal joint of maxillary palpus either straight or slightly curved posteriorly.

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Mesosternum with a feeble transverse carina, sometimes elevated at middle, forming a slight pyramidal protuberance; maxillary palpi not longer than in *Philydrus*; tarsal claws simple..... .....Cymbiodyta.

Mesosternum with a compressed conical process; maxillary palpi long and slender; claws broadly toothed at base in male, less in female.

Helocombus.

PHILYDRUS Sol.

The characters of this genus have been so often and so well given, that it is not necessary to dwell further at this time on those by means of which the genus may be known from others to which it is most closely related. Some few points will be alluded to here in order to avoid their frequent repetition in the specific descriptions.

Each species seems to be invariable in color, excepting such apparent variation as may be due either to evident immaturity or the mode of preparation for the cabinet. The five following—*carinatus*, *cuspidatus*, *cinctus*, *consors* and *perplexus* are truly piceous in color, the others are various shades, usually called testaceous, with the qualifying adjectives piceo, brunneo or pale, according to the species or specimen.

The sculpture consists of a punctuation, very regularly disposed over the surface, which is never coarse, nor is it ever densely placed, the distance between the punctures being at least their own diameter and sometimes more, but in *cinctus* it is rather closer than usual.

On the head in front of and within each eye is an arcuate row of coarser punctures. The thorax has two series on each side of coarse punctures, one beginning near the front angle arching inward and backward toward the middle, the other row transverse beginning at the middle of the lateral margin. At the base of the thorax is a fine marginal line very well marked in all the species, except *nebulosus*, *cinctus* and *ochraceus*, where it is extremely faint or entirely absent.

The elytra have four rows of coarser punctures, that one nearest the side margin is very irregular and contains the most punctures, the three rows between this and the suture are more regular and with fewer and more distant punctures. In some species these series are very indistinct. All the species have the sutural stria well impressed from the apex three-fourths to base, where it is gradually evanescent. Pl. iii, fig. 2.

Sexual structures have been observed in nearly all our species of such an obvious nature that it is remarkable that no mention has been made of them. In nearly all of our species the males have at

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least one of the claws of the front tarsus distinctly toothed at base, and in *reflexipennis*, *diffusus* and *Hamiltoni*, the tooth is so large, and in the last two so everted, that when the tarsus is seen directly from above it seems tridactyle. As there are differences between nearly all the species these will be more fully alluded to in their proper place.

Failure to notice the sexual characters led me, in 1873, to attach too great importance to the form of the mesosternal lamina in the separation of species. It is now known that the form of the lamina is by no means constant in a series of specimens, nor is it of the same form in the sexes. As a rule the males have the more prominent lamina, the angle more prominent and the anterior edge more oblique, while in the female the angle approaches more nearly a right angle by the front edge being more nearly vertical. This is well illustrated in the various forms observed in *nebulosus*. Profile views are given of all the laminæ drawn in every instance from the male.

In those testaceous species with black head it will be observed that the male has usually the anterior half of the head pale while in the female the head is entirely piceous, except a triangular space before each eye.

All our species are entirely piceous and opaque beneath, the femora are also opaque, densely punctured and pubescent, except for a short distance at apex.

The differences in the structure of the maxillary palpi afford the means of subdividing the genus into two primary groups, as follows:

Last two joints of maxillary palpi nearly equal in length...S. G. **ENOCHRUS.**
Last joint always shorter than the third.....S. G. **PHILYDRUS.**

ENOCHRUS Thoms.

This subgenus contains in our fauna three species, two of which have the prosternum longitudinally carinate.

Prosternum carinate.
Entirely piceous, tarsi alone pale; anterior claw of male slightly angulate at base.....**carinatus.**
Thorax, elytra, tibiæ and tarsi pale rufo-testaceous, head and under side piceous; anterior claw of male very distinctly toothed.....**fucatus.**
Prosternum not carinate.
Piceous, sides of head and thorax pale.....**cuspidatus.**

But one other species, *bicolor* Payk, of Northern Europe is known; our species are from the Western side of the continent and still further illustrate the relationship, which has already been alluded to, between the faunæ of the Pacific region and Europe.

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PHILYDRUS Sol.

The remainder of our species belong to this series. One only is peculiar to California, the others are Eastern, although one-half of them extend in their distribution across the continent to California.

The species may be arranged in the following manner:

Prosternum distinctly carinate..... .....**nebulosus.**
Prosternum not carinate.
Mesosternal lamina very feeble..... .....**ochraceus.**
Mesosternal lamina well developed and with a distinct angular projection.
Anterior claws of male not distinctly toothed, although with a basal angulation; piceous species..... .....2.
Anterior claws, at least, well toothed in male; species more or less testaceous (except *consors*).....3.
2.—Subdepressed species, sides of elytra gradually obliquely descending; basal marginal line of thorax always distinct; claws of male scarcely broader at base..... .....**perplexus.**
Transversely very convex, sides of elytra almost vertical; basal marginal line extremely indistinct; front claw of male slightly angulate at base..... .....**cinctus.**
3.—The front (or inner) claw of anterior tarsus of male alone toothed.
Entirely piceous, transversely very convex, sides nearly vertical; large species ....**consors.**
Brownish testaceous, head alone piceous; broadly oval, subdepressed species..... .....**californicus.**
At least one claw on each tarsus of male toothed.
Head more or less piceous.
Thorax with large discal piceous space.....**Hamiltoni.**
Thorax entirely testaceous.....**diffusus.**
Head and entire upper surface testaceous.....**reflexipennis.**

The species of this genus are peculiarly distributed. Of those belonging to the section *Enochrus*, two are restricted to the Pacific coast region (*carinatus, cuspidatus*), the third (*fucatus*) is from the adjacent regions of Utah and Arizona. Of Philydrus proper but one (*californicus*) is restricted to the West coast, all the rest may be considered Atlantic region species, although several extend across the continent to California and Oregon.

P. carinatus Lec.—Oblong oval, slightly narrower in front, pitchy black, shining, sides of thorax sometimes a little paler, surface comparatively coarsely and closely punctate, the elytra with the usual series of coarser punctures, in which, however, the punctures are few. Thorax with an arcuate row of coarse punctures which begins near the front angles, extending toward the middle, a second series extending transversely inward from the middle of the lateral margin. Body beneath black. Legs black, the tarsi above pale. Length .20 inch.; 5 mm. Pl. iii, fig. 7.

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The prosternal carina is feebly elevated, except in front, where it is prolonged in a short dentiform process. The mesosternal lamina is broadly triangular, the lower edge oblique to the axis of the body, the anterior edge also oblique, the angle acute, sometimes slightly dentiform.

The males have both the anterior claws similarly dilated at base, but not forming a distinct tooth, the middle claws less dilated, the posterior simple. In the female the front claws are very slightly broader at base, the middle and posterior simple.

One ♀ specimen in my cabinet has the legs entirely rufo-testaceous, but does not seem to differ in any important structural characters, and while it may indicate a distinct species, it is retained here until a similar male is found.

Occurs in Oregon and California.

P. fucatus Horn.—Oblong oval, distinctly narrower in front, moderately convex, yellowish testaceous or ochraceous, head entirely piceous black, body beneath black, tibiæ and tarsi pale. Thorax finely, moderately closely punctate, the anterior oblique row of larger punctures distinct, the transverse series indistinct. Elytra a little less closely punctate than the thorax, punctures less impressed, but a little more distant and coarser toward the apex, the punctures of the usual larger series indistinct. Length .20—.22 inch.; 5—5.5 mm. Pl. iii. fig. 10.

The prosternal carina is well elevated at the anterior end. The mesosternal carina horizontal beneath, nearly vertical and slightly sinuous in front, the free angle slightly mucronate.

Front claws of male equal, each rectangularly toothed, middle claws toothed, posterior claws broadened at base. In the female the front claw is like the middle claw of the male, the middle claw slightly thickened at base, the posterior claw simple.

The surface is quite shining, as if varnished. In the few specimens examined it seems not to vary appreciably.

Occurs in Utah and Arizona.

P. cuspidatus Lec.—Oval, slightly oblong, a little narrower in front, moderately convex, piceous black, sides of thorax distinctly, of elytra very indistinctly paler. Head black, a large pale space in front of each eye, moderately closely punctate, with the usual arcuate series of coarser punctures. Thorax piceous, sides paler, the same color extending narrowly along the apex, surface moderately coarsely and closely punctate, more finely at middle, the usual arcuate and transverse series of coarser punctures. Elytra punctate similarly to the thorax, but more coarsely and less closely near the apex, the usual series of coarse punctures not well defined on the disc, but deep and coarse near the apex. Body beneath piceous, opaque. Legs piceous, opaque, tibiæ and tarsi paler. Length .14 inch.; 3.5 mm.

Prosternum not carinate, mesosternum with a stout lamina, the lower edge horizontal and sinuous, the apex mucronate.

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The only specimen before me is a male in not good condition, enough remains to show that on the front feet the claws are dilated at base, but not forming a distinct tooth, the middle claws less dilated, the posterior very feebly.

It is hardly to be wondered at that this species should have been referred to Hydrobius, considering its rather small size, and that the last two joints of the palpi are of about equal length, although the presence of a mesosternal *lamina* in place of a protuberance should have been suggestive.

In the light of our present knowledge of the value of the form of the pseudo-basal joint of the maxillary palpus and the presence of the coarser series of punctures on the head, thorax and elytra, the true position of the species becomes evident.

Although smaller, the species is closely related to *carinatus*, differing from that in the absence of any prosternal carina. This, however, seems rather a variable structure, so that future collections may show this to be merely a variation.

Occurs in the mountain regions of California near Lake Tahoe.

P. nebulosus Say.—Oval, slightly oblong, convex, shining, above variable* from pale yellowish testaceous to brownish testaceous, head entirely piceous, except a pale space in front of each eye, the clypeus of ♂ usually paler than the female. Thorax rather sparsely and indistinctly punctate, the punctures separated by two or three times their own diameters, the arcuate and transverse rows of coarser punctures very indistinct, basal marginal line either very indistinct or absent. Elytra punctured similarly to the thorax, the punctures more distant near the apex, the usual rows of coarser punctures scarcely discernible. Body beneath piceous, opaque; femora piceous, tibiæ and tarsi rufo-testaceous. Length .14—.18 inch.; 3.5—4 5 mm. Pl. iii, fig. 13.

The prosternum is distinctly carinate longitudinally, the carina more elevated in front.

The mesosternal lamina is prominent, but somewhat variable in form sexually and individually. In the male the lamina is somewhat triangular in form, the free edges oblique, the angle acute. In the female the lamina is more nearly square, the lower edge slightly oblique, the front either slightly oblique, or nearly vertical, the angle sometimes slightly mucronate.

In the male the claws of the front feet are dissimilar, the anterior claw having a moderate quadrangular tooth, the posterior simply angulate at base. The claws of the middle feet are also dissimilar,

* The variability in color seems due rather to the mode of collection and preservation than to an actual difference in nature.

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the anterior claw being less distinctly toothed than the anterior claw of the front foot, the posterior claw is also less angulate. The posterior claws are more nearly alike, the apical portion being somewhat irregular as in *reflexipennis*, with a quadrangular tooth at base, which is less developed on the posterior or inner claw.

The claws are similar on all the feet in the female, being more slender than in the male and merely a little broadened at base.

The variation in color has already been alluded to as dependent more on the mode of preparation than to any real difference in freshly captured specimens. No specimen is ever truly piceous.

The punctuation varies to a degree which has caused the separation of forms unnecessarily. In Northern specimens (Canada) the punctuation is well marked, although no specimens have been seen in which there is any sharpness of definition or closeness of punctuation seen in nearly all the other species. The more we approach the warmer regions of the South (Arizona and California) the smoother the specimens become, and in some of them it is nearly impossible to detect any punctuation at all.

The rather small size of this species will enable it to be readily known at a glance from the others, except the immature forms of *ochraceus*, but the sternal structure will enable it to be separated.

The preceding remarks will explain the reason of uniting *cristatus* and *pectoralis* with the present species. In my former essay these were separated on the sculpture and form of mesosternal lamina, which are now seen to be variable either from locality in the case of sculpture, or sexually in the form of the mesosternal lamina.

Several species described by Motschulsky are considered identical *latiusculus*, *obtusiusculus* and *maculifrons*.

Zimmermann (Trans. Am. Ent. Soc. ii, p. 250) has placed *nebulosus* as a synonym of *Hydrophilus pygmæus* Fab., described from meridional America, without any good reason for so doing, although the description will not only fit this species, but quite a good number of others within the limits of the Fabrician acceptation of Hydrophilus.

Occurs from Canada and the N. E. States to Texas, Arizona and California.

P. ochraceus Mels.—Elliptical, less convex, shining, pale piceous, or piceo-testaceous, head always piceous with a paler space in front of each eye, the clypeus of male paler. Thorax distinctly and moderately closely punctate, the arcuate and transverse series of coarser punctures barely distinct, the basal mar-

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ginal line very feebly indicated. Elytra punctured similarly to the thorax, the punctures more distant and a little coarser near the apex, the usual series of larger punctures extremely indistinct. Body beneath piceous opaque. Femora piceous, tibiæ and tarsi rufo-testaceous. Length .14—.16 inch.; 3.5—4 mm. Pl. iii, fig. 14.

The mesosternal carina is very feebly prominent, the anterior edge arcuate, without distinct angle.

The claws in both sexes are so nearly like those of *nebulosus* that it is unnecessary to describe them.

This species varies in color, and probably from the same causes as have already been referred to in *nebulosus*. No specimen has been seen of truly piceous color in the manner illustrated by *cinctus* or *perplexus*.

Occurs from Canada to Illinois and Florida. Dr. Sharp notes its occurrence in Mexico.

P. perplexus Lec.—Oblong oval, fully twice as long as wide, piceous black, shining, the sides of the thorax and elytra with paler border, a paler spot usually in front of the eyes. Thorax closely punctate, the punctures finer at the middle than at the sides, the arcuate and transverse rows of coarser punctures distinct, but not deeply impressed. Elytral punctuation coarser than the thorax, closer toward the base, sparser and coarser toward apex, the usual series of larger punctures feebly indicated. Body beneath and legs piceous, tarsi paler. Length .16—.22 inch.; 4—5.5 mm. Pl. iii, fig. 6.

The mesosternal lamina is prominent, the lower edge slightly oblique, the anterior edge slightly sinuous and oblique, the free angle more or less mucronate.

The claws of the male are merely slightly broader at base and do not differ from those of the female except in being a very little stouter.

Canada and New England States to Florida and Texas.

P. cinctus Say.—Oval, slightly oblong, very convex transversely. sides of elytra nearly vertical, piceous black shining, the sides of thorax and elytra with paler border. Thorax closely punctate, the oblique and transverse rows of coarser punctures distinct, but feebly impressed, basal marginal line, at best, feebly developed and never entire. Elytra a very little more coarsely, but less closely punctured than the thorax, the usual rows of coarser punctures distinct, but feebly impressed. Body beneath and legs black, the tarsi pale. Length .26—.28 inch.; 6.5—7 mm. Pl. iii, fig. 5.

The mesosternal lamina is moderately thick, the lower edge horizontal, the front edge nearly vertical, the free angle slightly mucronate. In the female the anterior edge is more oblique.

The anterior claws of male have each an irregular basal dilatation, but not forming a distinct tooth, the middle claws are less angulate and the posterior are nearly simple. The anterior and middle claws of the female have a very feeble basal dilatation, the posterior claws nearly simple.

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This species, from its facies, seems to be most closely allied to *consors*, an association which is further indicated by the form of the male organ, but the claws are not, properly speaking, toothed. For the latter reason it is better associated with *perplexus*, which has the claws even less angulate at base.

Occurs from Canada and the New England States westward to Kansas and South to Georgia.

P. consors Lec.—Oblong, black, shining, transversely very convex, sides of elytra nearly vertical, underside and legs entirely black, tarsi slightly paler. Thorax very finely punctate, smoother at the sides, the anterior oblique and the median transverse row of coarse punctures very well marked, basal marginal line distinct in its entire length. Elytra a little more coarsely, but less closely punctured than the thorax and more indistinct toward the apex, the usual rows of coarser punctures indistinctly impressed. Length .28—.32 inch.; 7—8 mm. Pl. iii, fig. 4.

The mesosternal lamina is triangular, the lower edge oblique to the axis of the body, the front edge nearly vertical, free angle acute, but not mucronate.

The front claws of the male are very nearly alike, each being broadly toothed, the free angle of the tooth acute, the middle and posterior claws are simply a little broader at base. In the females the claws are simply a little broader at base and less curved than in the male.

Resembles *cinctus*, but slightly more oblong in form, without a paler border and with different mesosternal lamina and male claws.

Occurs in Louisiana and Florida (Schwarz).

P. californicus n. sp.—Broadly oval, less convex, brownish testaceous, head behind the suture piceous in both sexes, the clypeus pale ♂, or with a broad median space piceous ♀. Thorax moderately closely punctate, the arcuate and transverse series feebly indicated, hind angles very obtuse. Elytra punctured similarly to the thorax, but more sparsely near the apex, the usual series of coarser punctures very faintly indicated. Body beneath opaque black. Femora piceous, tibiæ and tarsi pale. Length .18—.20 inch.; 4.5—5 mm. Pl. iii, fig. 8.

Mesosternal plate not prominent, the lower edge slightly oblique, the front oblique, the angle not mucronate.

In the male the anterior claws are dissimilar, the front claw having a quadrangular dilatation at base, the posterior merely slightly broader. The middle claws are equal and merely slightly angulate at base. The posterior claws are equal and slightly broader at base.

In the female the claws are alike on all the feet. They are more slender than in the male, and very slightly broadened at base.

Among the species with pale elytra, simple prosternum and toothed claws, the present species is known by its much broader and more depressed form, and in the male by the claws being very feebly toothed in comparison with what is observed in the other forms.

This species was formerly considered by me as *latiusculus* Mots.

Occurs in California (probably northern).

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P. Hamiltoni n. sp.—Oblong oval, scarcely narrowed in front, moderately convex, above piceo-testaceous or pale brownish, head behind the suture piceous, clypeus usually testaceous ♂, or broadly piceous at middle ♀; thorax with an indefinite, semi-circular space piceous, a small dark spot on each umbone. Thorax not very closely punctate, smoother near the sides, the usual arcuate and transverse series of coarser punctures extremely indistinct. Elytra a little more coarsely punctured than the thorax, toward the apex more sparsely and less deeply, the discal rows of coarser punctures scarcely discernible. Body beneath and femora opaque black, the trochanters, tibiæ and tarsi testaceous. Length .16—.22 inch.; 4—5.5 mm. Pl. iii, fig. 9.

The mesosternal lamina is moderately prominent, the lower edge horizontal, the anterior edge vertical and sinuous. the angle distinctly mucronate.

The anterior pair of claws of the male are dissimilar, the front claw having a long lobe-like, obtuse tooth at base, which is slightly everted, the hinder claw rectangularly toothed. The middle pair of claws are similar, and each has a broad rectangular tooth. The posterior claws are smaller, slightly irregular in shape, each has an acute tooth at base smaller than in the middle claws. The claws of the female are alike on all the feet, and are merely broadened at base.

This species might readily be mistaken for a larger *reflexipennis* when recently captured specimens are compared, a resemblance which is increased by a slight explanation of the sides of the elytra near the apex. It will be observed, however, that in *reflexipennis* the head is always entirely pale, as also the thorax, while in the present species the posterior portion of head, at least, is piceous. The darker disc of the thorax is present, with very rare exception, while in *reflexipennis* it is never so.

The characters observed in the male claws will certainly separate the two species, while the more general characters above given must be relied on for the other sex.

Occurs in Canada (Pettit), Massachusetts (Blanchard), the coast of New Jersey (Hamilton), northern California and Oregon.

P. diffusus Lec.—Oblong oval. moderately convex, pale piceo-testaceous above, head behind the frontal suture piceous or black, clypeus piceous at middle. Thorax moderately closely punctate, the punctures coarser toward the side, the arcuate and transverse rows of coarser punctures well marked. Elytra a little more coarsely punctured than the thorax, the punctures somewhat coarser, but less dense toward the apex. the usual rows of coarser punctures rather indistinctly impressed. Body beneath and femora piceous opaque, tibiæ and tarsi pale. Length .18—.24 inch.; 4.5—6 mm. Pl. iii, fig. 11.

The mesosternal crest is prominent, the lower edge oblique, the anterior edge oblique, the angle feebly mucronate.

The claws of the anterior male feet are dissimilar, the front claw having a large lobe-like tooth at base, which is not in the same plane as the tip of the tooth, so that when viewed directly from above the claw seems double, the posterior claw is less curved and has a rectangular tooth at base. The claws of the

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middle and hind feet are all very nearly alike, the tip of the claw being somewhat irregular, the tooth at base rectangular or slightly acute.

The claws of the female are more slender and less curved than the male, and the base is merely slightly broadened without distinct tooth.

This species resembles *Hamiltoni* in form and sculpture, and very nearly in coloration; there is, however, no thoracic piceous space, which seems to be quite characteristic of *Hamiltoni*. The males of the two species are distinguishable by the form of the claws, the tooth of the anterior claw being much more everted here than in any other species. As is usual with all pale species the head is much darker in the female than in the male.

Occurs in Illinois, Dakota, Wyoming, Nebraska and California.

P. reflexipennis Zimm.—Oblong, subdepressed, sides of elytra especially near the apex slightly explanate, color yellowish or pale piceo-testaceous, moderately shining. Thorax moderately closely punctate, the anterior arcuate and posterior transverse series of larger punctures scarcely evident. Elytra more coarsely punctured than the thorax, less closely near the apex, the usual series of larger punctures discernible, but indistinct. Body beneath and femora piceous, tibiæ and tarsi pale. Length .14—.18 inch; 3.5—4.5 mm. Pl. iii, fig. 12.

The mesosternal lamina is not large, the lower edge oblique, the front edge oblique and slightly sinuous, the free angle is somewhat mucronate.

The claws of the front tarsi of the male are dissimilar, the anterior claw having a rather long and acute tooth, the posterior strongly angulate at base. The middle claws are like the anterior, but the tooth and angulation are less marked. The posterior claws are dissimilar, and both have a well marked tooth at base, the free portion of the tip forming an angle with the basal portion and is somewhat sinuous.

In the female the claws are dissimilar on all the feet and have merely a slight angulation at base as in the posterior middle claw of male.

This is the only species at present known to me in which the head is always and entirely pale like the remainder of the surface.

Occurs on the sea-coast of Delaware and New Jersey (Dr. Hamilton). One from Bennington, Vt., has been sent me by Mr. C. H. Roberts.

HELOCHARES Muls.

The differences between this genus and Philydrus are extremely small, and are practically reduced to the form of the pseudo-basal joint of the maxillary palpus. In this genus it is curved with the concavity to the front and the palpi themselves are longer and more slender. Pl. iii, fig. 1.

The cephalic and thoracic sculpture is about the same in the two genera, but we here observe quite commonly, but by no means con-

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stantly, a coarse puncture near the basal edge of the thorax on each side of middle. While in Philydrus four irregular series of coarse punctures are observed on the elytra, here we have but two placed on the fifth and ninth intervals.

The presence of a well marked mesosternal lamina in most Philydrus and its absence in Helochares seems not to be a character of any great importance as one species of the former (*ochraceus*) has merely a mesosternal carina, which is nearly as well marked in one of the Helochares (*normatus*).

The two species known to me are separable as follows:

Mesosternum without trace of carina; mentum entire in front. **maculicollis.**

Mesosternum feebly carinate; mentum slightly emarginate.....**normatus.**

The first of these species belongs to the Atlantic region, the other to the Pacific.

H. maculicollis Muls.—Oblong oval, very obviously narrowed in front, subdepressed, moderately shining; color above luteous or piceo-testaceous, thorax with a rather large piceous spot, head with irregular piceous spaces. Thorax closely punctate, punctures coarser toward the sides, the anterior arcuate row of punctures very evident, the transverse series indistinct, basal marginal line absent. Elytra broadest slightly behind the middle; the surface with ten moderately deeply impressed striæ, which are rather finely serrately punctured, the striæ ending abruptly a short distance in front of the apical margin, the tenth stria distant from the side, scutellar stria short; intervals flat, finely sparsely punctulate, the fifth and ninth intervals with a row of coarser punctures. Body beneath black, feebly shining. Femora piceous, opaque, tibiæ and tarsi rufo-piceous. Length .16—.22 inch.; 4—5.5 mm.

The prosternum is carinate, but never very distinctly. The mesosternum has a slight tuberosity at middle, somewhat rugose. The claws are similar on all the feet and alike in the sexes, they are feebly curved, slightly dilated at base, but not toothed. In specimens which I suppose to be males the last ventral segment has a slight emargination at the middle of its apex.

Variations have been observed in color and sculpture. In what seem to be fresh and well-preserved specimens the color is luteous, with the usual piceous spot on the thorax, but from this the color becomes gradually darker, seemingly to piceous. The head may be entirely piceous with a pale space in front of the eye, or the occiput only may be dark. In one specimen the entire head is simply margined with piceous.

While the sculpture of the thorax is usually well marked, the punctures close, specimens are seen with fine punctures more widely spaced. The variation in color of head and thoracic sculpture are entirely independent of sex.

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Occurs in Ohio, Illinois, Missouri, Kentucky, North Carolina Florida to Texas.

H. normatus Lec.—Oblong oval, narrowed in front, subdepressed, form and color generally of *maculicollis*. Thorax similarly punctured. Elytral striæ scarcely impressed, the punctures coarser and less close than in *maculicollis*, and very nearly reaching the apex, the intervals flat, scarcely distinctly punctulate, the fifth and ninth with a row of coarse punctures. Body beneath and legs as in *maculicollis*. Length .20—.22 inch.; 5—5.5 mm.

The prosternum is very feebly carinate. Mesosternum longitudinally feebly carinate, nearly as in *Phil. ochraceus*.

The claws are alike in the sexes and simply slightly thickened at base.

The male has the last ventral segment feebly notched as in *maculicollis*.

While this and the preceding species resemble each other so closely superficially, two important structural characters separate them. In *maculicollis* the apex of the mentum is arcuate, here there is a distinct emargination. The mesosternum also differs in the two species.

The emarginate mentum and feebly carinate mesosternum seem to be the two important characters defining *Chasmogenus* Shp. (Biol. Cent. Am. i, 2, p. 73) founded on a species in which the elytra are not striate. While it would be defensible to place our species in that genus, I am unwilling to that extent to admit the validity of *Chasmogenus*. The color and sculpture vary here as in *maculicollis*, and the elytral striæ may be slightly impressed, or consist merely of rows of punctures.

Occurs from San Francisco southward into the peninsula, and thence eastward to Arizona. It is highly probable that it extends also into Mexico.

CYMBIODYTA Bedel.

We owe to the acute observation of Dr. Sharp a knowledge of the fact that in this genus the middle and hind tarsi have completely lost the first joint, which, though quite short, is very readily seen in the other genera. The tarsi are, therefore, heteromerous with the formula 5–4–4.

The maxillary palpi are of moderate length, the pseudo-basal joint being curved in such a manner that the concavity is to the front, being the reverse of Philydrus. The curve is, however, not well marked, and in the striate species the joint is so nearly straight that, for purposes of classification, it might well be called so, especially when compared with the convex-forward curve of Philydrus or the concave-forward curve of Helochares. In the non-striate spe-

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cies the curve is better marked. In the relation of the last two joints to each other in length our species of Cymbiodyta are intermediate between the two sections of Philydrus, that is to say, while these joints are not equal in length as in *Enochrus*, the terminal joint is so little shorter than the preceding that, without careful observation, they might be thought equal.

In some of the species there is a faint indication of a carina at the apex of the prosternum. The mesosternum is not laminate as in Philydrus, but has in all our species a slightly elevated, transverse ridge, placed directly in front of the intercoxal process of the metasternum. This ridge affects three forms which give useful aid in separating the species. These forms are — straight and directly transverse —, arcuate ⌒, or elevated at middle at an angle so that when viewed from behind it is in the form of Λ with a little broader angle. The last form seen in *fraterculus* and *rotundus* explains the origin or meaning of the spine-like process seen in Helocombus.

Contrary to the prevailing tendency in Philydrus the basal marginal line of the thorax is never present. The large puncture near the basal margin on each side is quite distinct in all the species, although quite often very indistinct or wanting in some individuals.

The general sculpture is the same as in Philydrus, and the same series of coarse punctures on the head and thorax may be observed, and in more than half of the species the elytra have distinct striæ of punctures varying in number from four entire striæ to ten. The rows of coarse punctures which have, apparently, no definite position in Philydrus are here distinctly located on the alternate intervals beginning with the third.

In the species belonging to the Atlantic region proper the elytra are not striate; they have, however, the coarse interstrial punctures, which are approximated at apex forming a semblance to striæ, but no trouble need result if the student will compare these with the punctures seen in the striate species. In my former descriptions this error occurred, and it now gives me pleasure to correct it, and at the same time give the proper interpretation of the sculpture.

The underside of the body in sculpture and vestiture is the same as in Philydrus, and the femora are finely punctured, pubescent and opaque, except for a short distance near the tip. Sexual characters have not been observed, and the males can be distinguished when the organ is protruded, but apparently not otherwise.

With two exceptions the species are piceous black in color with

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lustrous surface becoming paler only by evident immaturity. The two brownish species have a black head, although in *Blanchardi* the sides of the head in front of the eyes are very pale, as is the case in all the pale species of Philydrus. Color is as constant a character here as been observed in Philydrus and the only difficulty may result from the lack of skill on the part of an observer in properly distinguishing what is an immature specimen of a piceous species, or a discolored example of a brown one.

With these preliminary remarks the student will be enabled to separate the species by the aid of the following analytical table. In counting the striæ reference is made only to those which exist as such and not to the traces seen through the elytra when these are pale or immature in color.

Elytra with distinct striæ.
- All the striæ entire; mesosternal transverse ridge straight and feebly elevated. **punctatostriata.**
- Inner striæ much abbreviated.
  - Six outer striæ entire, seventh nearly so; mesosternal ridge angulate and elevated at middle, when viewed posteriorly in form of Λ. Pl. iii, fig. 18d ..... **fraterculus.**
  - Five outer striæ entire; mesosternal ridge straight, transverse, feebly elevated; color piceous, with paler border; coarse punctures of alternate intervals indistinct..... **dorsalis.**
  - Four outer striæ only entire; mesosternal transverse ridge arcuate, feebly elevated; color as in *dorsalis;* coarse punctures of alternate intervals distinct Pl. iii, fig. 18c..... **morata.**
  - Four outer striæ only entire and very feebly impressed; mesosternal ridge feebly elevated, arcuate; color piceo-ochraceous or pale castaneous, head black, thorax with large piceous spot..... **imbellis.**

Elytra without striæ (except the sutural).
- Form oval; mesosternal ridge well marked; serial punctures of elytra distinct, at least at the sides.
  - Piceous broadly oval; mesosternal ridge angularly elevated at middle in the form of Λ..... **rotunda.**
  - Piceous, less broadly oval; mesosternal ridge straight, transverse, feebly elevated. Pl. iii, fig. 18b..... **fimbriata.**
  - Piceo-ochraceous, head black, with a large yellow spot in front of each eye; mesosternal ridge as in *fimbriata*..... **Blanchardi.**
- Form oblong; mesosternal ridge very short, transverse; coarse serial punctures of elytra absent; piceous with paler border. Pl. iii, fig. 18a. **lacustris.**

C. punctatostriata Horn.—Form rather broadly oval, scarcely narrowed in front, subdepressed, piceous shining, the entire border somewhat paler. Thorax closely and evenly punctate, the anterior arcuate and the transverse series of coarser punctures distinct, but of few punctures, basal marginal line absent. Elytra with ten entire striæ and a short scutellar row of punctures, striæ moder-

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ately deeply impressed, except the four inner near the base, the punctures gradually coarser near the apex and in the outer striæ, and very closely placed, intervals flat, finely punctulate, toward the apex quite smooth, intervals 3-5-7-9 each with a row of coarse punctures. Body beneath piceous, opaque. Femora piceous, opaque and pubescent, tibiæ and tarsi rufo-piceous. Length .18—.22 inch.; 4 5—5.5 mm.

Prosternum with a slight trace of a carina near the apex, mesosternum with a short, feebly elevated transverse ridge slightly in front of the coxæ.

The claws are slender and simple in both sexes, and no character has been observed by means of which the sexes may be separated, except when the male organ is protruded.

Occurs in California from Tejon northward, in Lake, Santa Clara and Alameda Counties.

C. fratereulus Sharp.—Oval, slightly oblong, moderately convex, piceous, shining, entire border somewhat paler. Thorax closely punctate, a little more coarsely and less closely toward the sides, the arcuate and transverse rows of coarse punctures distinct, basal marginal line absent. Elytra striato-punctate, the striæ being scarcely impressed, there being six or seven entire rows of punctures, the inner rows gradually shorter toward the suture, the punctures of the rows rather coarse and closely placed, intervals punctured similarly to the thorax, but gradually finer and more sparse toward apex, the intervals 3-5-7-9 each with a row of coarse punctures. Body beneath piceous, opaque. Femora piceous, opaque and pubescent, tibiæ brownish, tarsi paler. Length .18—.22 inch.; 4.5—5.5 mm.

The prosternum is simple, the mesosternum with a slight elevation, which is broadly conical when seen from in front, and Λ when seen posteriorly.

Tarsal claws slender and simple, sexes not separable, except when the male organ is visible.

In this species there are always six entire rows of punctures, and often a seventh continued by finer punctures to the base, the inner striæ are shorter. While the number of entire striæ will readily distinguish the species, the most important character is found in the elevation of the transverse ridge of the mesosternum in a short conical process.

Occurs in southern Arizona, extending southward well into Mexico.

C. dorsalis Motsch.—Oval, slightly oblong, scarcely narrowed in front, moderately convex, piceous black, shining, entire border paler. Thorax finely and rather closely punctate, the arcuate and transverse series composed of very fine punctures. Elytra punctured similarly to the thorax, the punctures finer, sparser and less distinct toward the apex, at the sides with five entire striæ, which are gradually more impressed toward the side, the punctures coarse, deep and closely placed, especially externally, the inner striæ short, composed of finer punctures, the sutural stria deeply impressed, and extending three-fourths to base, scutellar stria very faintly indicated, intervals 3-5-7-9 with a row of coarser punctures faintly indicated. Body beneath piceous opaque. Femora piceous, tibiæ and tarsi rufo-piceous. Length .18—.22 inch.; 4.5—5.5 mm.

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Prosternum simple, mesosternum with a feebly elevated transverse ridge a short distance in front of the coxæ.

Claws similar in the sexes, slender, slightly broader at base.

Motschulsky describes the species as having five or six striæ, which is correct enough, although it seems to me preferable to count only the five that are well marked. In my previous essay this species is placed as possibly identical with *imbellis* Lec., but specimens were then not known to me agreeing with the description.

The specimens collected in the central and in the mountainous regions have more distinct sculpture than those in the warmer regions further south, where the specimens are much less deeply punctate and generally smoother.

Occurs from middle California southward into the peninsula of California.

C. morata n. sp.—Oval, slightly oblong, not narrowed in front, moderately convex, piceous shining, the entire border paler. Thorax moderately closely punctate, less distinctly and more sparsely toward the sides, the arcuate and transverse rows of coarser punctures scarcely evident. Elytra, near the base, punctured similarly to the thorax, near apex much more finely and sparsely, almost smooth, the outer four striæ moderately impressed and entire, the punctures rather coarse, but not densely crowded, the inner striæ very faintly indicated and scarcely extending more than a third from the apex, sutural stria well impressed and longer, coarser punctures of intervals 3-5-7-9 well impressed. Body beneath piceous opaque. Femora piceous, opaque, tibiæ and tarsi rufo-piceous. Length .20—.24 inch.; 5—6 mm.

Prosternum simple, mesosternum with a slightly elevated arcuate ridge slightly in front of the coxæ.

Claws similar in the sexes, slender, feebly arcuate, slightly broadened at base.

At first sight this species might be mistaken for *dorsalis*, which it resembles superficially in form and color. That species has, however, five entire striæ, this but four, the interstitial coarse punctures are very well marked here and scarcely evident in *dorsalis*.

An immature specimen in my cabinet was formerly referred to *imbellis*, and the number of entire striæ is the same in both species, but in *imbellis* they are not impressed, and the punctures much finer. The color is quite different in the two species also.

Occurs in New Mexico near the Moqui Villages.

C. imbellis Lec.—Oblong oval, scarcely narrower in front, moderately convex, piceo-ochraceous or castaneous, with the border paler, head black, thorax with a large piceous space extending from apex to base. Thorax closely punctulate, punctures a little coarser and less dense toward the sides, the arcuate and transverse rows of coarser punctures distinctly marked. Elytra less closely punctulate than the thorax, the punctures a little coarser and less close toward

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the apex, the outer five scarcely impressed, striæ entire, composed of moderately impressed, closely placed punctures, the inner striæ scarcely reaching the middle from apex, the sutural stria well impressed and longer, the coarser punctures of the intervals 3-5-7-9 barely distinguishable. Body beneath piceous, opaque. Femora piceous, opaque, tibiæ and tarsi rufo-testaceous. Length .20—.24 inch.; 5--6 mm.

Prosternum entirely simple, mesosternum with a short, arcuate, transverse ridge, slightly in front of the coxæ.

Tarsal claws similar in the sexes, slender, feebly arcuate, slightly broadened toward base.

This species is similar in sculpture to *dorsalis*, but the striæ and punctures are much less impressed and the coarser punctures of the alternate intervals very feebly indicated. The mesosternal ridge in that species is a straight transverse line, here it is very strongly arcuate. The color of the two species is also quite distinct, that being always piceous, while this is an indefinite rusty-brown or pale chestnut color, resembling at first sight *Phil. Hamiltoni.*

Occurs in California from Tejon northward.

C. rotunda Say.—Very broadly oval, moderately convex, piceous, shining, border indefinitely paler. Thorax closely punctate, more sparsely toward the sides, the arcuate and transverse series of coarse punctures well marked. Elytra punctured similarly to the thorax, but less closely near the apex, the two inner series of coarse punctures very indistinct, the outer series well marked, sutural stria deeply impressed, extending two-thirds to base. Body beneath black, subopaque. Femora and tibiæ piceous, the tarsi pale. Length .26--.28 inch.; 6.5--7 mm.

Prosternum simple, mesosternum with a transverse ridge elevated in an angular form so that when viewed posteriorly it presents the form of a broad Λ.

Tarsal claws simple and slender in the two sexes.

This species is the most broadly oval of any in the Philydride series. In the specimen before me the elytra seem slightly explanate at apex, but this may be an individual character.

In previous papers Dr. LeConte has compared the species with *Hydrobius globosus*, while I have suggested *Philydrus cinctus*. Neither comparison is very satisfactory, inasmuch as it is far less convex than the former and more broadly oval than the latter. It is not very greatly different in form and appearance from some of the larger specimens of *H. fimbriatus*, although more decidedly oval.

It seems to be quite rare in collections, being represented, as far as known to me by one specimen each from the Middle States region and North Carolina in the cabinet of Dr. LeConte and one in my own collected near Tewksbury, Mass., and kindly given me by Mr. Blanchard.

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C. fimbriata Mels.—Oval, slightly oblong, very little narrower in front, moderately convex, piceous, shining, the entire border narrowly, but indefinitely paler. Thorax closely punctate on the disc, more sparsely and less deeply at the sides, the arcuate and transverse series well marked. Elytra near base punctured similarly to the thorax, at apex more sparsely and less distinctly, the usual series of coarse punctures well marked, sutural stria deeply impressed three-fourths to base. Body beneath opaque black. Femora opaque black, tibiæ piceous, tarsi rufescent. Length .18—.22 inch.; 4.5—5.5 mm.

Prosternum simple, mesosternum with a nearly straight, transverse, elevated ridge.

Claws slender, feebly arcuate, slightly broader at base, similar in the sexes.

This species resembles *Philydrus perplexus*, although a little broader in form. In the present genus its form is intermediate between *lacustris* and *rotunda*. From both species it differs in the form of the mesosternal ridge.

When specimens of this species are immature it is not at first sight easy to separate them from specimens of *Blanchardi*, which may be a little dark from defective preparation, but after one becomes familiar, by examination, with the shape of the two species there need be no great difficulty, especially as it will be observed that *Blanchardi* has the head in front of the eyes pale, while in *fimbriata*, no matter how immature the specimen may be, the head is of one uniform color.

Specimens are known to me from Canada, New England States, Pennsylvania and Texas. It is evidently very widely distributed.

C. Blanchardi n. sp.—Form rather broadly oval, scarcely narrowed in front, moderately convex, piceo-ochraceous, head black, with a large pale space in front of each eye. Thorax moderately closely punctate, more sparsely near the sides, the arcuate and transverse series of coarser punctures not very distinct. Elytra similarly punctured, although a little less closely than the thorax and much more sparsely near the apex, the series of coarser punctures indistinctly represented by a few distant punctures, the outermost series alone being distinct, sutural stria well impressed and reaching rather more than two-thirds to base. Body beneath piceous or brown, opaque, rarely black. Femora and tibiæ brownish, tarsi paler. Length .16 inch.; 4 mm.

Prosternum simple, mesosternum with a very distinct, straight, transverse ridge, moderately elevated.

Claws simple and slender in the two sexes.

This species represents, in its color, *imbellis* of the striate series, although there is no discal piceous space on the thorax. It is also very like *Philydrus ochraceus*, but is more broadly oval in form. The character of the mesosternal ridge is very like *fimbriata*. It is the only species of the genus in our fauna in which, with a black head, the sides in front of the eyes are pale, as in many Philydri.

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Occurs in Vermont (Roberts), Massachusetts (Blanchard), Pennsylvania (Hamilton) and District of Columbia (Ulke).

C. lacustris Lec.—Oval, decidedly oblong, moderately convex, piceous, shining, entire border indeterminately paler. Thorax relatively coarsely and closely punctate, more sparsely and less deeply at the sides, the arcuate and transverse rows of coarse punctures very evident. Elytra punctured similarly to the thorax, but a little less closely and somewhat more sparsely toward the apex, the usual series of coarse punctures never present. except by very rare exception, sutural stria extending nearly three-fourths to base. Body beneath opaque black. Femora opaque, piceous, tibiæ and tarsi rufo-piceous. Length .16—.18 inch.; 4—4.5 mm.

The prosternum is simple, the mesosternum has a very short, transverse, elevated line.

The claws are similar in the sexes, slender, feebly arcuate, slightly broadened at base.

This is the smallest species of the genus at present known in our fauna. Its essential characters are—the oblong form, the absent serial coarse punctures of the elytra, and very short transverse ridge of mesosternum. It will also be observed that the last two joints of the maxillary palpi differ very little in length, the terminal joint being only slightly shorter than the preceding.

Occurs in the Lake Superior and Canadian region, eastward to the New England States.

HELOCOMBUS n. g.

Tarsi heteromerous with the formula 5–4–4. Maxillary palpi very long and slender, the pseudo-basal joint curved with the concavity in front, the last joint very distinctly shorter than the preceding. Mesosternum with a broad pyramidal process, when viewed from behind elevated like a narrow Λ and acute at apex. Femora punctured, opaque and pubescent. Tarsal claws distinctly toothed in the male, rather widely dilated at base in the female. Pl. iii, fig. 15.

The thorax has no basal marginal line. Elytra deeply striate, the striæ entire, except the sutural and the second, no scutellar stria, interstices without the three or four series of coarse punctures.

This genus, founded on *Philydrus bifidus* Lec., is, to a certain extent, intermediate between Cymbiodyta and Philydrus. It has the tarsi and pseudo-basal palpus joint of the former and the toothed claws of the greater number of the latter. The mesosternum is peculiar in its protuberance, being structurally a great exaggeration of the form foreshadowed in *H. fraterculus* and *rotundatus*, as has been indicated in the remarks under Cymbiodyta.

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Cymbiodyta Bedel is said both by that author and Dr. Sharp to have a laminate mesosternum, consequently this species is not referable there, while neither author makes any mention of the toothed claws, nor is there any reference to especially long maxillary palpi.

For the above reasons I feel compelled to separate it, at least for the present, with another generic name, the only other recourse being to continue it with Cymbiodyta, in which it would certainly form a well marked subdivision.

H. bifidus Lec.—Oblong-oval, feebly narrowed in front, piceous, shining, subdepressed. Thorax closely and finely punctate, more coarsely and less closely at the sides, the usual arcuate and transverse rows of coarser punctures well marked, lateral marginal line deeply impressed, basal line wanting. Elytra rather deeply striate, especially at the sides and near the apex, the striæ all entire, except the sutural and second, at bottom not punctate, intervals convex at the sides, flatter on the disc, punctate, more coarsely and less closely than the thorax, the sides of each interval slightly crenate, alternate intervals without coarser punctures. Body beneath and eyes black, opaque, tarsi rufo-testaceous. Length .22—.28 inch.; 5.5—7 mm.

Prosternum simple, mesosternum with a pyramidal process, higher than wide at base, when viewed from behind in form of **A**.

Claws dissimilar in the sexes and unlike on each pair of feet.

In the male the anterior claw of the front feet has a rather broad but acute triangular tooth, the posterior claw rather abruptly broader at base, but not truly toothed; the middle feet have anterior claws toothed but in a less degree than the front feet; the posterior claw is as in the front feet; the posterior feet have both claws alike, and they are very nearly like the posterior claw of the middle feet.

In the female the claws are merely broadened at base without forming a tooth.

This insect resembles, in form and sculpture, *Hydrobius fuscipes*, but is less convex, and is usually found associated with that species in series sent by collectors. Independently of the more important structural characters, the long and slender maxillary palpi will at once distinguish it.

Occurs in Canada and the Lake Superior region, New England States southward to Georgia (coll. Lec.).

———o———

The species which were of old included in Hydrobius seem to have given much more trouble in their separation into tenable genera than Philydrus. The following table is the result of a study of the described genera from the literature as far as they are represented in our fauna; *Metacymus* is included for discussion.

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Elytra striate, or striato-punctate.....HYDROBIUS.
Elytra with confused punctuation.
Posterior femora glabrous.
Antennæ 9-jointed; mesosternum simple.....ANACÆNA.
Antennæ 7-jointed; mesosternum protuberant.....METACYMUS.
Posterior femur punctulate, opaque and pubescent; mesosternum protuberant. PARACYMUS.

In addition to the above Tritonus *Muls.* and Limnoxenus *Motsch.* have been suggested, which seem perfectly congeneric with Hydrobius as limited above. Creniphilus *Motsch.* was suggested to include two species afterward separated by Thomson as Anacæna and Paracymus.

Crenitis *Bedel* should have its place in the table near Paracymus. Of it Bedel writes as follows: "Distinct from *Hydrobius*, *Paracymus* and *Anacæna* by its scarcely spinulose tibiæ, and from the first two especially by its simple mesosternum and from the last by its prothorax without basal marginal line."

Unfortunately, these characters have no value when the species of our fauna are taken into consideration as will be learned in the following pages.

Moreover, the antennæ are said to be 9-jointed, but a specimen sent me by Dr. Sharp plainly shows 8-jointed antennæ as in *Creniphilus monticola.* It seems to me that the species on which Crenitis is founded (*punctato-striatus* Letz.) should take its place in the genus Creniphilus and be placed near *monticola.*

Dr. Sharp finds it advisable to include all the species under one generic name, although he separates Metacymus by its 7-jointed antennæ.

This genus seems surrounded with much doubt, and while he has suggested in a recent letter that it is related to the Derallus series (*i. e.* near Berosus) the description and the relationship in which it has been placed hardly warrant such an inference.

While the views expressed later on will be found in accord with those who are not willing to retain Anacæna and Paracymus distinct, there will be disagreement with those who unite all under Hydrobius. Inasmuch as it is impossible to retain those two genera as distinct, it seems to me at least inconvenient to use either name for a union of the two, I have, therefore, reverted to an undescribed name by Motschulsky, which had for its types the two species constituting the types of the separate genera. Other remarks on this subject will be found under Creniphilus.

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The following is the definition of the genera recognized in our fauna:

Elytra either striate or striato-punctate.....**Hydrobius.**
Elytra with confused punctuation; head, thorax and elytra, without the series of coarse punctures.....**Creniphilus.**

Hydrobius has the middle and posterior tibiæ fimbriate at apex with short, nearly equal, closely set spinules, while in Creniphilus the spinules are relatively long and irregular, not closely placed. Pl. iv, figs. 10–11.

HYDROBIUS Leach.

Maxillary palpi with the terminal joint always longer than the preceding. Prothorax either without or with basal marginal line, in the latter case indistinct and visible only at the sides of base. Elytra more or less deeply striate, or simply with striæ of punctures, interstices usually punctulate or scabrous, and with the coarser series of punctures on the alternate intervals beginning with the third, except in *scabrosus* and *tessellatus*. Femora more or less pubescent beneath, sometimes but feebly near the base. Tibiæ fimbriate at apex with short, closely set spinules. Posterior tarsi slender, not as long as the tibiæ.

It will also be observed in three of the species that the head has the coarser series of punctures forming an arcuate row as in the Philydroid genera, and on the thorax also similar groups, although here they unite in a semicircular row convex to the side margin.

The mesosternal protuberance does not have here the same importance observed elsewhere, as it varies considerably within specific limits, notably in *fuscipes*.

In the present essay the genus is limited to the large species with the elytra striato-punctate, or striate in ten regular series. Even as thus restricted to a small number of species, it is more heterogeneous in aspect than any other genus in the family. On characters which are now admitted to be unimportant nearly every species in the European fauna has at one time or another had a separate generic name suggested for it. Our species would be in the same plight if similar characters were made use of, with the result of unnecessarily complicating the study.

The following analytical table will enable the species to be separated:

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Alternate intervals of the elytra, 3-5-7-9, with a row of coarse punctures.
Thorax with the lateral series of coarse punctures; the base without marginal line.
Elytra with well marked striæ; form oblong.....**fuscipes.**
Elytra with rows of fine punctures; form short and very convex.
Posterior femora merely closely punctate near base, not opaque and pubescent. Pl. iv, fig. 7.....**tumidus.**
Posterior femora densely punctulate and pubescent near base and along the upper border. Pl. iv, fig. 4.....**globosus.**
Thorax without the lateral series of coarse punctures; basal marginal line distinct near the sides.....**latus.**
Alternate intervals without the series of coarse punctures.
Thorax with traces of basal marginal line at sides; surface opaque, subgranular; elytra without trace of scutellar stria; form oval, not very convex.....**scabrosus.**
Thorax without trace of basal marginal line; surface shining; elytral striæ deep, the scutellar very well marked, intervals smooth and convex. **tessellatus.**

In the table used in my former essay on these insects the carinæ of the pro- and meso-sterna were given considerable prominence as characters for separation, but the increase of material for study has shown that both carinæ are subject in one species or other, to too much variation to enable them to be used with certainty.

H. fuscipes Linn.—Oblong, convex, piceous, shining. Head closely punctate, an arcuate series of coarser punctures on each side of clypeus, a small group within each eye. Thorax finely closely punctate, a little more coarsely, less densely at the sides, the anterior arcuate and posterior oblique series of coarse punctures well marked, basal marginal line entirely wanting. Elytra striate, striæ variable in depth of impression, the two inner and the scutellar striæ very indistinct at base, striæ closely punctate, rather finely on the disc, more coarsely at the sides, intervals flat, not densely punctulate, intervals 3-5-7-9 with the usual series of coarse punctures placed near the outer side of the respective intervals, a less regular series between the tenth stria and the lateral margin. Body beneath opaque black. Legs piceous, the tibiæ sometimes, the tarsi always paler. Femora opaque, densely punctulate and pubescent, except near the tip. Length .26—.32 inch.; 6.5—8.5 mm. Pl. iv, fig. 2.

Prosternum not carinate, mesosternum obtusely elevated in a variable degree.

Tarsal claws simple, merely gradually broader at base.

The most striking variation observable in this species is in the form of the mesosternal protuberance being in some specimens well marked and prominent, forming a distinct angle, while in others it is so reduced as to be merely a slight longitudinal convexity.

The general color of the species is piceous black, but specimens occur with a slight æneous surface lustre, or even violaceous. The

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sculpture variation is that usually observed in punctato-striate species, and is never very great.

Occurs over the greater part of the northern regions of the continent and in California, extending southward to the Colorado River. It is a common European species, more abundant in the northern regions.

H. globosus Say.—Slightly oblong, hemispherical, piceous black, shining, surface faintly æneous. Head closely punctate, with the usual series of coarser punctures. Thorax closely punctate, nearly equally over the entire surface, the coarser punctures of the anterior and posterior series united in a curve near the lateral margin, basal marginal line entirely wanting. Elytra with ten entire striæ of moderate punctures, closely placed near the base, more distant toward apex, scutellar stria distinct, striæ not impressed, intervals flat, sparsely, finely punctulate, the usual series of coarser punctures on intervals 3-5-7-9, also between the tenth stria and the margin. Body beneath opaque black. Legs piceous, tarsi rufescent; posterior femora densely punctured and slightly pubescent near the base only, exteriorly coarsely sparsely punctured and shining. Anterior and middle femora densely punctured and pubescent, except near the apex. Length .30 inch.; 7.5 mm. Pl. iv, fig. 4.

Prosternum simple, mesosternum with a prominent triangular lamina, the postero-inferior edge thick.

Tarsal claws simple, similar in the sexes.

This insect appears to have been almost simultaneously described by Say and Germar, and it might be a very difficult question to decide which name has the priority, and no profit would come of the investigation. The name given by Say is now well known, and has been the recognized name for three-fourths of a century. It is rather remarkable that Germar's name, *Sphæridium melænum*, should have been completely lost to sight in our literature.

Occurs in the New England and Middle States.

H. tumidus Lec.—Oval, very little longer than wide, very convex, piceous black, shining, surface with slight æneous lustre. Head moderately closely punctate, with coarse punctures as in *globosus*. Thorax moderately, closely, and equally punctate, coarser punctures as in *globosus*. Elytra striato-punctate, striæ not impressed, punctures not coarse, closely placed near base, sparser and finer near apex, striæ entire, except the sutural and second, scutellar stria not evident, intervals flat, punctate more coarsely than in *globosus*, and with large punctures arranged as in that species. Body beneath opaque black. Legs piceous, tarsi rufescent; posterior femora entirely glabrous, coarsely sparsely punctured, middle femora densely punctured and pubescent near the base only, anterior femora opaque, except near the tip. Length .34 inch.; 8.5 mm. Pl. iv, fig. 7.

Prosternum either with a very small, acute, tubercle at apex, or simple; mesosternum with a lamina as in *globosus*, nearly vertical in front.

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By its convexity and color this species greatly resembles *globosus*. The general sculpture is rather coarser, the form more elongate and the femora quite different in sculpture.

Occurs from New York to Florida, but seems rare.

H. latus Horn.—Broadly oval, distinctly narrowed in front, piceous or slightly brownish, feebly shining. Head with coarse and very fine punctures intermixed, not closely placed, a denser group within each eye, clypeus broadly emarginate. Thorax regularly convex, hind angles very obtuse, basal marginal line distinct near the sides, surface with coarse and fine punctures intermixed, rather sparsely placed and feebly impressed at the middle of the disc, dense and much coarser at the sides, the arcuate and oblique series of coarser punctures scarcely discernible. Elytra with ten entire, moderately impressed striæ and a short scutellar row of punctures, striæ moderately, coarsely crenately punctured, at the sides much more coarsely, intervals flat, faintly scabrous, the 3-5-7-9 with the usual series of coarse punctures. Body beneath opaque black. Legs piceous or brown, the femora of all the legs densely punctulate and pubescent at basal half, but less in the hind femora, smooth and shining at apex. Length .30 inch.; 7.5 mm. Pl. iv, fig. 5.

Prosternum with a distinct cariniform elevation near the apex, mesosternum obtusely protuberant, the lower edge of the protuberance in form of ∩.

Tarsal claws simple and slender in both sexes. The prosternal carina is but small in its greatest development, and in some specimens almost entirely disappears. This species is remarkable in having a sharp line of demarcation between the densely punctulate and the smooth portions of the femora also in having the basal marginal line of thorax distinct at the sides.

Occurs at Fort Crook, California.

H. scabrosus Horn.—Oval, slightly oblong, distinctly narrowed in front, piceous or brown, opaque, or with very feeble lustre. Head coarsely and closely punctate at the sides, smoother at middle, without trace of the arcuate row of punctures, clypeus distinctly emarginate. Thorax regularly convex, a vague depression of the middle of the disc near the posterior margin and a shallow fovea in the place of the puncture seen in other species, hind angles very obtuse, basal marginal line distinct near the hind angles, surface coarsely and densely punctured, rugulose at the sides, smoother at middle. Elytra with ten entire, moderately deeply impressed striæ, the scutellar stria entirely wanting, striæ coarsely, but vaguely and not closely punctured, intervals flat, granulate or scabrous, disc vaguely depressed each side of suture near apex. Body beneath piceous, opaque. Legs brownish; posterior femora glabrous, coarsely punctate, except for a very small space at base, middle and front femora densely punctured and pubescent one-third from base. Length .20—.24 inch.; 5—6 mm. Pl. iv, fig. 6.

Prosternum finely carinate its entire length, and more elevated in front; mesosternum simple, without trace of protuberance.

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Claws slender, feebly curved and simple. The sculpture of the elytra is remarkable in being finely granulate and scabrous. The sutural stria is exactly parallel with the suture to base, so that there is no trace of scutellar stria. The usual coarse punctures of the alternate intervals are not present and are not merely concealed by the other sculpture.

The thoracic depressions near the base, faint as they are, indicate the last vestige of the sculpture usual in Helophorus, and the coarse puncture seen on each side of the base of the thorax in so many species is merely the remnant of the sinuous line each side of the median line in Helophorus.

Specimens are occasionally seen that are quite black and feebly shining.

Occurs in Vancouver, Oregon and California as far south as San Francisco. A specimen in my cabinet from Arizona is probably from the more northern and mountainous regions of that territory.

H. tesselatus Ziegler.—Broadly oval and very convex, pale castaneous, shining, elytra indistinctly marked with slightly darker, small spaces without definite pattern. Head coarsely, deeply, not closely punctate, clypeus much smoother and moderately deeply emarginate. Thorax coarsely, not closely, but somewhat irregularly punctate, a vague depression opposite the middle of each elytron, hind angles rounded, basal marginal line extremely fine and indistinct. Elytra oval, very nearly as broad as long, very convex, more elevated posterior to base, ten entire striæ moderately deeply impressed, scutellar stria well marked and impressed, striæ with coarse moderately close, but not crenate punctures, the intervals convex, smooth, the 3-5-7-9 slightly more so than the others, but without trace of the coarse series of punctures. Body beneath brownish, opaque. Legs brown, the basal half of all the femora opaque, punctulate and pubescent. Length .28—.30 inch.; 7—7.5 mm. Pl. iv, fig. 3.

The prosternum has merely a slight elevation in front, mesosternum slightly convex, but without pubescence.

Claws slender and simple in both sexes. The indefinite spots of color are principally at the sides and apex, a large triangular scutellar space being without them.

The curious aspect of this species as compared with the others would suggest the probability of its belonging to a genus or division apart from them, but as I have before remarked there is absolutely nothing which can be used for separation. It is but little more convex than *globosus*, but the anterior portion of the body being more deflexed causes it to appear more so, and while the point of greatest convexity is nearly the same in *globosus* and *tesselatus*, the curve of the elytra when viewed from the side is much more convex here.

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The head is less transverse than usual from the fact that the sides of the clypeus are more nearly parallel.

Occurs from Canada southward to Florida and from Massachusetts to Illinois. It seems rare in every locality.

CRENIPHILUS Motsch.

Maxillary palpi short and stout, the terminal joint longer than the preceding. Prothorax without basal marginal line. Elytra never either striate, or with regular series of punctures, sutural stria deep, but obliterated at basal fourth. Posterior femora glabrous, except in *infuscatus*. Posterior tibiæ fimbriate at apex with relatively coarse and long spinules, unequal in length and not closely placed. Posterior tarsi variable, sometimes slender and longer than the tibiæ, often stouter and rather shorter than tibiæ.

In addition to the above diagnosis it may be more specifically stated that the elytra are punctured in a confused manner, although in several of the species a faint tendency to a linear arrangement may be observed, especially near the apex. The head and thorax are entirely deprived of the series of larger coarse punctures so well marked in all the species of the preceding genera, except in three Hydrobius. From the manner of elytral sculpture it must be evident that the coarse punctures arranged in series must also be absent. The mesosternum may be either absolutely plain or more or less protuberant, but never greatly. The prosternum is carinate in several species.

In separating our small species of Hydrobius from the larger ones, the desirability of which has been admitted by every systematist who has studied them, the question of a name for the series presented itself for serious consideration.

In glancing over our species it will be seen that two forms occur, first those with the posterior femora opaque and pubescent, similar to the other femora, represented in our fauna by *infuscatus* alone, secondly those with glabrous femora to the posterior legs, to which the remainder of our species may be referred. The first series is *Anacæna* Thoms., while the second contains some that are *Paracymus* Thoms., and others that would be excluded. Therefore, neither of the above names can be properly applied to the aggregate series. Castelnau's name *Brachypalpus* would be a very good one, but his genus is composed of Philydrus and Hydrobii. Mulsant's *Tritonus* is founded on a species very plainly inseparable from Hydrobius

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proper. Motschulsky's genus *Creniphilus*, although merely indicated and not fully described, has for its types *punctulatus* (= *æneus* Germ.) and *limbatus* (= *globulus* Payk.), which are the types of *Paracymus* and *Anacæna*. For this reason *Creniphilus* is adopted, indicating, as it does, my idea that the other two genera cannot be properly retained as distinct. In his most recent work (Biol. Cent. Am. vol. i, 2) Dr. Sharp has gone a step still further back, and retains Hydrobius as adopted by Lacordaire and the authors of the Catalogus.

In glancing over the analytical table there will be observed a very important character relegated to second place, namely, the occurrence of 8-jointed antennæ in two species. To use this character as a means of defining another genus would associate two very unlike species, unlike not only in form, but also in the structure of the two sterna, and the logical result would be the formation of two other genera. If, then, we return to those species with 9-jointed antennæ, one certainly will be an *Anacæna*, while the others must be again separated by the plane (*Paracymus*) or protuberant mesosternum. Thus five genera will be named, all with a more or less complicated nomenclature confusing to the student and without benefit to science.

The question might here be answered as to the reason for ignoring such an important character as the loss of an antennal joint. It will be admitted that, in every family of Coleoptera, there is a standard or normal number of antennal joints, to which in some families all the members conform, while in other families there is a variation in the number, sometimes either below or above the standard, and in the Scarabæidæ, especially, both the latter styles of variation occur within the family limits. In fact, such is the plasticity in the Melolonthide Scarabæidæ, that instances are by no means rare of antennæ having the standard number on one side and a less number on the other, and more even than this, we find more rarely specimens having both antennæ reduced in number of joints from the standard of the species to which the individual undoubtedly belongs.

The antennæ are organs of some sense beyond that of the somewhat mechanical sense of touch, but what that sense is need not be discussed at this time Whatever it is, the sense is indicated by and resides in specially organized surfaces indicated by punctuation of a peculiar kind, small foveæ, pubescent patches, or otherwise as is familiar to those who go over the entire coleopterous series.

The entire antenna is not sensitive. With very few exceptions it may be stated, as a general rule, that at least three basal joints are

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not sensitive, while the number may be still greater, reaching eight in Geotrupini. In many families the greater number of antennal joints have sensitive surfaces, while in others that quality is confined to a limited number of antennal joints, In the first category we find the Adephaga, Elateridæ, Buprestidæ, Cerambycidæ, Chrysomelidæ, while in the second are the Scarabæidæ, the Anobiide and Bostrichide Ptinidæ and Hydrophilidæ. In this latter category the antenna consists of two well defined parts, the sensitive apical and the basal, which has no other function than that of a mechanical support.

It is evident that inasmuch as the basal portion of the antenna is devoid of the structure which makes the antenna an organ of special sense, the *number* of the joints has no importance so long as they subserve their mechanical function. It is in the joints from the second to the sensitive club, of whatever form that club may be, that plasticity of structure is illustrated to the confusion of systematic students.

In the case which has given rise to the preceding discussion we observe constantly two basal joints of nearly equal dimensions in all the species, three terminal sensitive joints not very unlike specifically, and between the two a number constituting a funiculus composed of four joints in all (with three exceptions), some of which are very small, and it is not remarkable that joints 4–5, the smallest of all, should be found to have coalesced in the two species mentioned. For the same reason the existence of a species (or possibly a genus) with a still further reduction to a total of seven joints might have been expected, an occurrence which Dr. Sharp says he has observed in Metacymus (Biol. Cent. Am. i, 2, p. 65). As there is no reason to doubt the accuracy of the latter statement, it may be safely asserted that seven joints is the limit beneath which the number will not go in Hydrophilidæ.

The following table will assist in the recognition and arrangement of our species:

Form oblong, fully twice as long as wide; tarsi slender, the posterior fully as long as the tibia; pro- and mesosternum absolutely simple; posterior femora not or feebly pubescent.....2.

Form elliptical convex, not much longer than wide; tarsi stouter, the posterior pair shorter than the tibiæ ..... 3.

2.—Elytra parallel, or oblong oval; thorax very distinctly punctate, the sides bordered with pale.

Antennæ 9-jointed.....**dissimilis.**

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Thorax with a pale border not alutaceous.
Thorax entirely piceous, and, with the head, alutaceous.....**moratus.**
Antennæ 8-jointed; thorax alutaceous.....**monticola.**
Elytra distinctly narrowed posteriorly almost from the humeri; thorax quite smooth and entirely piceous.....**suturalis.**
3.—Posterior femora longitudinally strigose and sparsely punctate.
Prosternum distinctly carinate: mesosternum with distinct protuberance.
Elytra very indistinctly punctate; antennæ 9-jointed.....**despectus.**
Elytra well punctate; antennæ 8-jointed.....**subcupreus.**
Elytra not punctate; antennæ 7-jointed; mesosternal elevation almost laminiform.....**degener.**
Prosternum absolutely simple.
Mesosternum more or less protuberant, sometimes, however, with a slight tubercle only.....**digestus.**
Mesosternum absolutely plane.....**rufiventris.**
Posterior femora densely punctulate and pubescent, except near the tip; color never a true piceous black and without æneous lustre.
infuscatus.

C. dissimilis Horn.—Oblong, subdepressed, piceous, shining, lateral border of thorax testaceous, more broadly posteriorly, sometimes also the outer portion of the apical border (Pl. iv, fig. 14) sides of elytra indistinctly paler. Antennæ 8-jointed, testaceous, club piceous. Head relatively coarsely and moderately closely punctate. Thorax moderately coarsely and closely punctate, hind angles distinct but obtuse, basal marginal line absent. Elytra oblong, parallel, narrowed at apical third, sutural stria deeply impressed two-thirds to base, surface closely punctured, a little more coarsely than the thorax, when viewed longitudinally forming indistinct lines, the two outer striæ faintly indicated by slightly coarser punctures. Body beneath piceous, opaque. Legs piceous, tibiæ and tarsi pale. Posterior femora with a finely punctured, but not opaque space near the base, otherwise smooth and sparsely punctate, anterior and middle femora densely punctulate, opaque and finely pubescent, except the apical third Length .12—.16 inch.; 3—4 mm.

Prosternum simple, mesosternum without trace of any elevation whatever.

Maxillary palpi stout, the pseudo-basal joint (Pl. iv, fig. 13) especially thickened. Claws slender, simple and feebly curved.

This insect resembles strikingly some of the smaller forms of *Cymbiodyta lacustris*, and is therefore very much less convex and more parallel than usual in the present series.

The two specimens from which the original description was made were plainly immature, the elytra being brown and the legs quite pale, but more mature specimens since obtained are entirely piceous black with the sides of the thorax very decidedly and of the elytra indistinctly paler.

Occurs in Oregon and California as far south as San Francisco.

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C. moratus n. sp.—Oblong, subdepressed, piceous black, surface with a very faint bronze lustre. Antennæ 9-jointed, testaceous at base, club piceous. Head moderately coarsely and closely punctate, the intervals very distinctly alutaceous. Thorax moderately, coarsely and closely punctate, more finely on the disc, intervals alutaceous. Elytra oblong parallel, sutural stria distinctly impressed two-thirds to base, surface shining, not alutaceous, punctuation coarser, but not closer than on the thorax, and when viewed longitudinally, especially near the apex, exhibiting a tendency to form rows. Body beneath piceous, opaque. Legs entirely piceous. Posterior femora faintly strigose, sparsely punctate, middle and front femora pubescent and opaque, except at tip. Length .12 inch.; 3 mm.

Prosternum simple, mesosternum without trace of elevation.

Maxillary palpi piceous, stout. Claws slender, simple and feebly curved.

This species may be readily known from either *dissimilis* or *monticola* by its entirely piceous thorax, and while it has the head and thorax distinctly alutaceous as in *monticola*, it has the 9-jointed antennæ of *dissimilis*.

Three specimens collected in Utah were kindly given me by Mr. Charles W. Strumberg.

C. monticola n. sp.—Oblong oval, subdepressed, piceous; elytra ochraceous or pale brown, thorax with pale border at apex, sides and base externally (Pl. iv, fig. 15). Head entirely piceous, finely but not closely punctate, interspaces extremely minutely alutaceous. Antennæ 8-jointed (Pl. iv, fig. 17), testaceous, club piceous. Thorax three times as wide as long, moderately coarsely, but not very closely punctate, the intervals distinctly alutaceous, basal marginal line entirely absent. Elytra oval, sides arcuate, disc more coarsely punctate than the thorax, coarser near the apex, but more sparse, the punctures seen in a longitudinal direction giving the vague appearance of striæ, especially near the sides. Body beneath piceous, opaque. Femora piceous, tibiæ and tarsi rufo-testaceous, femora punctulate, pubescent and opaque, except near the apex, the posterior pair, however, less opaque than the others. Length .10—.14 inch.; 2.5—3.5 mm

Prosternum and mesosternum entirely simple. Maxillary palpi short and moderately stout, the basal joint not especially thickened (Pl. iv, fig. 12). Claws slender and simple.

This species has been supposed to be identical with *dissimilis*, and as far as color goes, fits the description better than the mature specimens of that species. It differs superficially in color, the elytra being always ochraceous, the number of joints of the antennæ and the form of the pseudo-basal joint of the maxillary palpi. The apical margin of the thorax is here always with a pale border, never so in *dissimilis*, except when the specimens are palpably immature.

Occurs abundantly in the White Mountain region of New Hampshire. I have one from Pennsylvania.

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C. suturalis Lec.—Oblong oval, narrower posteriorly, moderately convex, piceous black, very shining, side margin of thorax and lateral border of elytra beginning one-third from humerus, yellowish testaceous. Antennæ 9 jointed, testaceous, club darker. Head very indistinctly, sparsely punctate. Thorax very smooth and shining, the punctuation very sparse and fine, indistinct, no basal marginal line, the lateral pale border sharply limited, wider posteriorly. Elytra very smooth and shining, near the base scarcely at all visibly punctate, the punctures, however, quite distinct near the apex and at the sides. Body beneath piceous, opaque. Legs piceous, or rufo-piceous, the tibiæ and tarsi always pale. Posterior femora finely longitudinally strigose, sparsely punctate, not pubescent, middle and front femora densely punctulate, pubescent and opaque, except at apex. Length .06—.08 inch.; 1.5—2 mm.

The prosternum and mesosternum are simple, without trace of carina. The maxillary palpi short and stout as in *monticola*.

This insect has a form in the series entirely its own being distinctly narrowed posteriorly as in *Limnobius*. In my first studies of it in 1873 it cost me considerable trouble to verify all the facts in relation to it from the fact that the small size made it troublesome to handle, and, because at the same time, I was led to differ so completely with the views expressed by Dr. LeConte. The abdomen has the usual number of segments of Hydrobius, but in the typical male the usually concealed sixth segment had become unusually prominent, and exhibits at its base a triangular depression, which is explained by an examination of the similar segment in any of the larger species of the tribe.

The original specific description says "*elytris parce subtiliter pubescentibus,*" and I have never been able to explain the use of such an expression in reference to an insect so smooth that even the punctuation is indistinct.

Occurs from Canada southward to Georgia, but not yet recorded from New England States.

C. despectus Lec.—Elliptical, very convex, piceous, surface distinctly æneous. Antennæ 9-jointed (Pl. iv, fig. 19), entirely rufo-testaceous. Head impunctate, very finely alutaceous (subgranular with high power). Thorax sparsely, finely and indistinctly punctate, surface rather more distinctly alutaceous than the head, no basal marginal line. Elytra very little more distinctly punctate than the thorax, the punctures distant, intervals distinctly alutaceous. Body beneath piceous. Legs reddish brown; posterior femora finely longitudinally strigose and sparsely obsoletely punctate, middle and anterior femora densely punctulate and pubescent, except at apical third. Length .06 inch.; 1.5 mm.

Prosternum distinctly carinate, mesosternum with a small but acute protuberance. Maxillary palpi as in *monticola*.

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This species is so like *subcupreus* that it might be mistaken for some of the smaller and smoother forms. The characters of the sterna and femora are alike in the two species, so that the only absolutely certain method of distinguishing them is in the number of joints of the antennæ. The two species are, however, readily separated by direct comparison, notwithstanding their structural resemblance. In a species so small as this in which the antennæ have a persistent tendency to fold beneath the head, the counting of the joints of the antennæ is extremely troublesome.

Occurs in Massachusetts, Pennsylvania, Michigan and Illinois.

C. subcupreus Say.—Elliptical, convex, piceous, surface very distinctly æneous. Antennæ 8-jointed (Pl. iv. fig. 18), testaceous, club piceous. Front moderately punctate, clypeus more closely and finely. Thorax equally, not closely punctate, intervals smooth, no basal marginal line. Elytra punctured similarly to the thorax, a little less closely and more coarsely toward the apex, without any tendency to a linear arrangement of the punctures. Body beneath piceous, opaque. Legs piceous or brown, the tarsi paler. Posterior femora smooth, with a few scattered punctures, middle and anterior femora punctulate and opaque, except at apical third. Length .06—.08 inch.; 1.5—2 mm.

Prosternum very distinctly carinate, mesosternum with a small, but acutely pyramidal protuberance. Maxillary palpi stout, formed as in *monticola*.

Specimens are of quite common occurrence in which the sides are paler, more distinctly so at the apex. The more northern forms of this insect are far more distinctly punctate than those from the south, and some recently collected by Dr. Hamilton on the sea-coast at Brigantine are, as a series, of smaller size than those found inland.

The antennæ are really 8-jointed, as observed by Dr. LeConte (Proc. Acad. 1855, p. 373), although he afterwards doubted his accuracy, but the character has been verified on a number of specimens by Mr. Blanchard as well as myself.

A very widely distributed species, occurring in the northern portion of the continent from the New England States through Canada to Oregon, thence South through California to Arizona, Texas, New Mexico and Nebraska. In the Atlantic region it is not known to me south of Virginia.

C. degener n. sp.—Elliptical, convex, piceous, faintly bronzed, sides of thorax and elytra rather broadly, but indefinitely paler. Antennæ 7-jointed, rufo-testaceous (Pl. ix, fig. 28). Head piceous black, vertex distinctly punctate, clypeus more finely and sparsely. Thorax shining, very distinctly and moderately closely punctate. Elytra not punctate, the surface finely alutaceous and subopaque, the sutural stria distinct from apex two-thirds toward base. Body

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beneath piceous. Legs piceous, tibiæ rufo-piceous. Posterior femora shining, longitudinally strigose and sparsely punctate, middle and anterior femora usually punctulate and pubescent, except for a short space at apex. Length .07 inch.; 2 mm. nearly.

Prosternum distinctly carinate, mesosternum with a prominent elevation, almost laminiform, the free angle prominent and acute.

Resembles *despectus*, but larger and less convex. The elytra have no punctures whatever, while in *despectus* there is punctuation, although feebly impressed and indistinct. The comparatively large and prominent mesosternal crest will afford the most certain means of separating the species.

The occurrence of but seven joints to the antennæ is one of the most remarkable characters of this species, and it is only after several examinations with the quarter inch objective of the compound microscope that I have been willing to risk the statement.

One specimen, Tampa, Florida, kindly given me by Mr. E. A. Schwarz.

C. digestus Lec.--Elliptical, convex, piceous black, shining, surface usually with slight bronze lustre. Antennæ 9-jointed (Pl. iv, fig. 20), testaceous, club piceous. Head moderately, closely and evenly punctate, faintly alutaceous. Thorax more than three times as wide as long, rather closely punctate, distinctly alutaceous, basal marginal line faintly evident near the angles. Elytra a little more coarsely and closely punctate at base than the thorax, more coarsely, sparsely and very distinctly substriately near the apex. Body beneath opaque, black. Femora piceous, tibiæ and tarsi somewhat paler. Posterior femora very finely longitudinally strigose and sparsely punctate, middle and front femora opaque, punctulate and pubescent, except at apical third. Length .10—.14 inch.; 2.5—3.5 mm.

Prosternum simple, mesosternum with a very small protuberance varying to a small tubercle. Maxillary palpi stout, the pseudo-basal joint thickened as in *dissimilis*.

This species presents no striking peculiarities. In series it is rather larger than the other species, and with rather coarser punctuation. To it *rufiventris* is closely related, and future collections may prove them identical.

Occurs from the mountainous regions of New Hampshire westward through Canada, and southward to New Mexico.

C. rufiventris Horn.—Elliptical, convex, piceous black, shining, surface with slight æneous lustre. Antennæ 9-jointed, basal joints testaceous, club piceous. Head moderately, closely punctate. Thorax moderately punctate, the punctures finer and sparser at middle, denser and coarser at the sides, no basal marginal line. Elytra more coarsely punctate than the thorax, more sparsely and coarsely near the apex, where the punctures tend to become subseriate: at

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the sides the two outer striæ are sometimes faintly indicated by coarser punctures. Body beneath piceous black, opaque. Legs piceous or brown. Posterior femora finely strigose, sparsely punctate, middle and front femora densely punctate, except at apical third. Length .10—.12 inch.; 2.5—3 mm.

Prosternum simple, mesosternum plane, without trace of any protuberance.

The above description will be found to differ in some points from that based on the unique in my former paper. That now proves to have been an immature specimen, hence the unfortunate trivial name. Superficially, it greatly resembles *digestus*, and it is only by an examination of the mesosternum that the two can be separated. As the protuberance in *digestus* is sometimes either a short, transverse ridge, or even a small tubercle, it may be possible that more material will show the desirability of uniting the two species.

Occurs in Oregon and Washington.

C. infuscatus Mots.—Rather broadly elliptical, convex, fusco-testaceous or ochraceous, head black, usually with a pale spot in front of each eye, suture of elytra narrowly infuscate. Antennæ 9-jointed, testaceous, club dark. Head usually closely punctulate. Thorax pale piceo-testaceous, with a rhomboidal darker space at middle, an arcuate space each side less dark (Pl. iv, fig. 16), disc distinctly and moderately closely punctate, a little coarser at the sides, no basal marginal line. Elytra piceo-testaceous or ochraceous, the suture narrowly darker, the punctuation a little coarser, but less close than on the thorax, without evidence of linear arrangement. Body beneath piceous, opaque. Legs piceous, tibiæ and tarsi usually paler. Femora of all the legs densely punctulate, pubescent and opaque, except for a short distance at apex. Length .08—.10 inch.; 2—2.5 mm.

Prosternum simple, mesosternum with a transverse ridge acutely elevated at middle. Maxillary palpi short and stout, the pseudobasal joint nearly as thick as in *dissimilis*.

As a rule the legs and antennal club are dark in color, but specimens have been seen with both comparatively pale.

At first sight this insect resembles some of the forms of *Phil. nebulosus*, although rather broader and more convex. The above description applies especially to specimens clean and free of discoloration. Many have merely a general brownish color until properly deprived of grease, while in others the dark spaces of the thorax form an indefinite cloud.

H. feminalis Lec. is one of those latter forms in which the punctuation of the surface is a little less distinct. Similar specimens occur in California.

H. castaneus Lec. is founded on dark, discolored specimens, with the greater portion of the disc of the thorax piceous, merely the

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sides paler. The mesosternum is slightly protuberant and within the recognized limits of variation in *infuscatus*, although Dr. LeConte states that the mesosternum is simple.

This species has been compared, very properly, with *globosus* Payk., both species belonging to Anacæna *Thoms.*

Occurs from Oregon southward to San Diego, eastward to Wyoming and Michigan, thence south to New Mexico.

In closing a paper it is always a pleasure to acknowledge the assistance given by friends to whom, during the progress of my own studies, my views have been made known and subjected in advance to that criticism which must follow publication. Therefore, to Dr. Hamilton, Messrs. Blanchard, Ulke and Schwarz, I express my thanks for critical aid as well as for the loan and gift of material.

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PHILYDRUS Sol.

P. **carinatus** Lec., Synopsis p. 370; Horn, Revis. p. 126.

P. **fucatus** Horn, Revis. p. 127.

P. **cuspidatus** Lec. (*Hydrobius*), Proc. Amer. Philos. Soc. 1878, p. 597.

P. **nebulosus** Say (*Hydrophilus*), Long's Exped. ii, p. 277; edit. Lec. i, p. 183; Horn, Revis. p. 127.

maculifrons Motsch., Bull. Mosc. 1859, iii, p. 179.

var. *cristatus* Lec., Synopsis, p. 370; Horn, Revis. p. 127.

latiusculus Motsch., loc. cit. p. 178.

pectoralis Lec., Synopsis. p. 370; Horn, Revis. p. 127.

obtusiusculus Motsch., loc. cit. p. 179.

P. **ochraceus** Mels., Proc. Acad. ii, p. 101; Lec., Synopsis, p. 371; Horn, Revis. p. 129.

simplex Lec., New Species, 1862, p. 24.

P. **perplexus** Lec., Synopsis, p. 371; Horn, Revis. p. 130.

fuscus Motsch., loc. cit. p. 178.

P. **cinctus** Say (*Hydrophilus*), Long's Exped. ii, p. 276; edit. Lec. i, p. 182; Horn, Revis. p. 129.

limbalis Mels., Proc. Acad. ii, p. 101.

P. **consors** Lec., New Species, 1862, p. 24; Horn, Revis. p. 129.

P. **californicus** n. sp.

latiusculus ‡ Horn, Revis. p. 130.

P. **Hamiltoni** n. sp.

P. **diffusus** Lec., Synopsis, p. 371; Horn, Revis. p. 129.

P. **reflexipennis** Zimm., Trans. Am. Ent. Soc. 1869, p. 250; Horn, Revis. p. 129.

angustulus Casey, Contributions ii, p. 83.

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HELOCHARES Muls.

H. maculicollis Muls., Ann. Sc. Phys. Nat. Lyon, vii, p. 379; Lec., Synopsis, p. 370; Horn, Revis. p. 130.

H. normatus Lec. (*Philhydrus*), Proc. Acad. 1861, p. 341; Horn, Revis. p. 126.

CYMBIODYTA Bedel.

C. punctatostriata Horn (*Philhydrus*), Revis. p. 131.

C. fraterculus Sharp, Biol. Cent. Am. i, 2. p. 71; App. p. 764.

C. dorsalis Motsch. (*Hydrobius*), Bull. Mosc. 1859, iii, p. 177.

C. morata n. sp.

C. imbellis Lec. (*Philhydrus*), Proc. Acad. 1861, p. 341; Horn, Revis. p. 131.

C. rotunda Say (*Hydrophilus*), Journ. Acad. v, p. 188; edit. Lec. ii, p. 292; Lec., Synopsis, p. 369.

nitens Zimm., Trans. Am. Ent. Soc. 1869, p. 250.

C. fimbriata Mels. (*Philhydrus*), Proc. Acad. ii, p. 101; Lec., Synopsis, p. 369.

semistriatus Zimm., loc. cit. p. 250.

C. Blanchardi n. sp.

C. lacustris Lec. (*Philhydrus*), Synopsis, p. 369; Horn, Revis. p. 131.

HELOCOMBUS n. g.

H. bifidus Lec. (*Philhydrus*), Synopsis, p. 371; Horn, Revis. p. 128.

HYDROBIUS Leach.

H. fuscipes Linn., see Muls. Col. Fr. Palpic. p. 122; Horn, Revis. p. 134.

seriatus, insculptus, regularis Lec., Synopsis, p. 272.

H. globosus Say (*Hydrophilus*), Long's Exped. ii, p. 276; edit. Lec. i, p. 182; Lec., Synopsis, p. 382; Horn, Revis. p. 134.

melænum (*Sphæridium*), Germ. Ins. spec. nov. p. 96.

H. latus Horn, Revis. p. 133.

H. scabrosus Horn, Revis. p. 133.

H. tesselatus Ziegler (*Sperchens*), Proc. Acad. 1844, p. 44; Lec. (*Sperchopsis*), Class. Col. N. A. edit. p. 47; Horn, Revis. p. 133.

CRENIPHILUS (Motsch.)

C. dissimilis Horn (*Hydrobius*), Revis. p. 136.

C. moratus n. sp.

C. monticola n. sp.

C. suturalis Lec. (*Limnebius*), Proc. Acad. 1866, p. 366; Horn (*Hydrobius*), Revis. p. 136.

C. despectus Lec. (*Hydrobius*), New Species, 1862, p. 25; Horn, Revis. p. 136.

C. subcupreus Say (*Hydrophilus*), Journ. Acad. v, p. 189; edit. Lec. ii, p. 293; Lec., Synopsis, p. 373; Horn, Revis. p. 135.

C. degener n. sp.

C. digestus Lec. (*Hydrobius*), Synopsis, p. 373; Horn, Revis. p. 135.

C. rufiventris Horn (*Hydrobius*), Revis. p. 135.

C. infuscatus Motsch. (*Brachypalpus*), Bull. Mosc. 1857, iii, p. 177; Horn, Revis. p. 135.

feminalis, castaneus Lec., Proc. Amer. Philos. Soc. 1878, p. 597.

In addition to the above species Kirby (Fauna Bor. Am. iv) cites *Philhydrus marginellus* and *melanocephalus*, two well known European species, as occurring in Canada. While his identifications are erroneous, the descriptions are not sufficiently definite to determine the species intended, although it is probable that the first is *Cymb. lacustris* and the latter *Phil. nebulosus*.

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EXPLANATION OF PLATE III.

Fig. 1.—Head and claw of Helochares.
" 2.—Philydrus, showing the series of punctures.
" 3.—Philydrus (*Enochrus*).
" 4.—Philydrus consors ♂, claws, mesosternal plate and penis.
" 5.—Philydrus cinctus ♂, same details.
" 6.—Philydrus perplexus ♂, same details.
" 7.—Philydrus carinatus ♂, same details.
" 8.—Philydrus californicus ♂ the two claws on each pair of feet, mesosternal plate and penis.
" 9.—Philydrus Hamiltoni ♂, same details.
" 10.—Philydrus fucatus ♂, details as in 4.
" 11.—Philydrus diffusus ♂, details as in 8.
" 12.—Philydrus reflexipennis ♂, same details.
" 13.—Philydrus nebulosus, claws of ♂ and penis, mesosternal plates showing variation, sexual and otherwise.
" 14.—Philydrus ochraceous, mesosternal plate.
" 15.—Helocombus bifidus ♂, head and claws.
" 16.—Philydrus, posterior leg.
" 17.—Cymbiodyta, posterior leg.
" 18.—Cymbiodyta, mesosternum as seen from a posterior view; *a*, lacustris; *b*, fimbriata; *c*, morata; *d*, fraterculus; *e*, marginella.

EXPLANATION OF PLATE IV.

Fig. 1.—Head of Hydrobius, antennæ a little too large.
" 2.—Hydrobius fuscipes, femora as seen beneath.
" 3.—Hydrobius tesselatus, idem.
" 4.—Hydrobius globosus, idem.
" 5.—Hydrobius latus, idem.
" 6.—Hydrobius scabrosus, idem.
" 7.—Hydrobius tumidus, idem.
" 8.—Creniphilus infuscatus, idem.
" 9.—Creniphilus digestus, idem.
" 10.—Hydrobius, right posterior tibia, under view.
" 11.—Creniphilus, idem.
" 12.—Creniphilus monticola, head and palpi.
" 13.—Creniphilus dissimilis, idem.
" 14.—Creniphilis dissimilis, coloration of thorax.
" 15.—Creniphilus monticola, idem.
" 16.—Creniphilus infuscatus, idem.
" 17.—Creniphilus monticola, antenna.
" 18.—Creniphilus subcupreus, idem.
" 19.—Creniphilus despectus idem.
" 20.—Creniphilus digestus idem.
" 21.—Helopeltis, head and palpi.

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A revision of the SPHÆRIDIINI inhabiting Boreal America.

BY GEO. H. HORN, M. D.

The species known to inhabit our fauna have never received special study, the "Synopsis of the Hydrophilidæ" by Dr. LeConte, ending practically at this tribe with the description of a few new species. A new study of some of the genera allied to Philydrus has made it advisable to continue the investigation with the hope of arriving at a clear understanding of the relationship of the two tribes.

The most interesting and instructive structures are found on the under side of the body along the median line, especially in the modifications of the various forms and developments of the three sternal pieces.

The mesosternum is especially worthy of attention as we here find an explanation of the partially developed structures of some of the species of the tribe Hydrobiini.

In the preceding paper I have endeavored to show that the mesosternal elevation is of two distinct types—*first*, that forming a true longitudinal lamina, of which Philydrus is the type, and *secondly* the transverse ridge and its modifications, which at times assume a pseudo-laminar form. In this latter series Cymbiodyta and Hydrobius furnish typical examples, although the modification of form in the former is gradual, its greatest development occurring in *C. marginella* and continuing still more in Helocombus. Attention is especially directed to these as occasion will be taken later on to refer to them.

Among the genera of the present tribe Cercyon alone has the laminate form of mesosternal elevation, all the others having a modification of the second type. In order to realize the relationship of the mesosternal forms other than Cercyon to the modification of the transverse ridge, it is merely necessary to trace the modifications already referred to in Cymbiodyta and Helocombus, in which there is a marked pyramidal elevation, entirely free and distant from the metasternum. If we now analyze the meso-metasternal elevation in Phænonotum it will be observed that the mesosternal portion by itself is quite that of the two genera above mentioned. In Phænonotum the mesosternum forms merely a small button on the end of

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the metasternal prolongation. From this we have gradually a larger extent developed through *Dactyl. advectum* to the ordinary arrow-head type so often seen, of which the pentagonal form of Cryptopleurum *et al.* is plainly a further extension.

In the Cyclonotum series alone the metasternum is so extended as to practically form the entire separation of the middle coxæ, and in Phænonotum is still more prolonged. In the latter genus and *Dact. advectum* the structure imitates that of Tropisternus and Hydrocharis in form, although of different composition.

The prosternum is usually elevated along the median line in a carina which varies in height from scarcely more than an elevated line in many Cercyon, to a lamina of considerable elevation in Dactylosternum.

In the Megasternum group, however, the prosternum is rather broadly elevated at middle, forming an area of varying shape, which extends between the front coxæ and is on the same plane with the meso-metasternal surface.

The form of the metasternal episterna does not seem to have attracted attention. It will be observed in the Cyclonoti that this portion attains its fullest development in width. In the Cercyones the episternum is narrower, but with parallel sides, while in the Megasterni the inflexed elytra cover a portion of the episternum, so that it seems very narrow, and in Cryptopleurum is concealed in front.

In several species of Cercyon the metasternal area is extended by a sinuous oblique line directed toward the anterior angles. The meaning of this is fully explained in Cryptopleurum in which the entire area thus limited is abruptly, although slightly, elevated above the remainder of the metasternal area. Pl. ix, fig. 9.

The first ventral segment has a distinct carina in all the genera, except Cyclonotum and Phænonotum, and in these it will be observed there is no distinct prosternal carina. Phænotypus has no distinct prosternal carina, but a well marked ventral carina.

The elytra are extended beyond the lower margin of the body in all the Cyclonoti, in the Cercyones the acute edge of the elytra is the true margin of the body, while in the Megasterni the elytra have no well defined acute edge and clasp, the body concealing the metasternal episterna in part and without distinctly discernible epipleuræ.

There are other characters of note which seem to have restricted value, these will be mentioned under the genera to which they belong.

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Dr. Sharp has observed that in one genus, *Cyloma*, the first joint of the middle and posterior tarsi is shorter than the second, while in *Perochthes* the first joint is lost entirely. The shortening and final loss of the first joint of the tarsus in a tribe in which that joint normally tends to be longer than the second is certainly very curious, and suggests the thought of relationship in other directions than the present tribe.

For the better study of the species, and as a means of showing the relationship between the genera, it is proposed to divide the tribe in three groups in the following manner:

Elytra extended below the lower surface of body, epipleuræ in great part vertical; metasternal side pieces wide.....Group CYCLONOTI.

Elytra not extended.

Elytra not inflexed; epipleuræ horizontal, distinct; metasternal side pieces moderate in width, parallel; prosternum carinate at middle. Group CERCYONES.

Elytra inflexed, clasping the sides of body, without distinct epipleuræ; metasternal side pieces narrow, partly covered by the inflexed elytra; prosternum elevated at middle, forming an area.....Group MEGASTERNI.

Group CYCLONOTI.

In this group the metasternum is prolonged between the middle coxæ, closely united with the mesosternal elevation, the suture always distinct, and often impressed.

The following genera occur in our fauna:

Prosternum moderately wide in front of the coxæ and strongly carinate between them; elytra with distinct striæ of punctures and an impressed sutural stria; metasternal side pieces rather wide and with parallel sides; first ventral segment carinate..... **Dactylosternum.**

Prosternum extremely narrow in front of the coxæ and not carinate between them; elytra with confused punctuation and a well marked sutural stria; metasternal side pieces moderately wide, the suture slightly arcuate; first ventral segment carinate..... **Phænotypus.**

Prosternum short in front of the coxæ and not carinate between them; elytra with confused punctuation and no sutural stria; metasternal area very small; metasternal side pieces wide, widest at middle, the suture rather strongly arcuate; first ventral segment not carinate.... **Phænonotum.**

In addition to the characters given above it will be observed that the antennal club of Phænonotum is quite loosely articulated, that of Dactylosternum rather close, while in Phænotypus that member is quite compact.

Other genera have been suggested which should probably be referred to this group, viz., Cyclonotum *Er.*, Cyloma, Perochthes and

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Heteryon *Sharp*. With the exception of the first I find it unsafe to attempt to correlate them with the others owing to the lack of data and the evident uncertainty with which others have been given.

DACTYLOSTERNUM Woll.

Mentum quadrate, broader than long, slightly narrower at base, broadly emarginate at apex, the angles rounded, surface broadly concave. Labrum scarcely visible; maxillary palpi moderate in length, the last two joints equal. Antennæ 9-jointed; tarsi 5-jointed on all the feet, the first joint nearly as long as the next two. Prosternum strongly carinate; metasternum prolonged in a process completely separating the middle legs, the episternum wide, the suture straight; mesosternum elevated in front of the metasternal process, usually in the form of an arrow-head (except in *advectum*), the suture between the two sterna well marked. First ventral segment distinctly carinate. Elytra prolonged downward beyond the body.

Although the more recent authorities, notably Dr. Sharp, have re-united the species separated by Wollaston with Cyclonotum; it seems better to retain them as distinct, or else go to the other extreme of suppressing nearly all the generic names proposed for species, which would, in the system of Lacordaire, be considered Cyclonotum.

There are several characters which seem quite important for use in separating the genera. Cyclonotum has not a well marked carina to the prosternum, nor on the first ventral segment. The antennal club is rather lax and the suture between the metasternum and its side piece is curved posteriorly. Wollaston indicates a difference in the tip of the mandibles, but this is extremely difficult to see without dissection.

Dactylosternum, on the other hand, has rather a close, but not compact club. The prosternum has a strong carina, and that of the first ventral segment is well marked. The lateral sutures of the metasternum are straight.

From what I can determine from description and the specimens in hand, Dactylosternum has the elytra striato-punctate, while Cyclonotum has a confused punctuation with the sutural stria alone evident.

One species described below has a form of mesosternal elevation differing materially from the usual arrow-head form, so that from a casual observation it would be supposed that the sternal arrangement

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was that of Phænonotum. This might be considered sufficient groundwork for a new generic name, but from my study of the variation among the species of Cercyon and the other genera, it is quite likely that intermediate forms of mesosternum will be found.

The species known to me are the following:

Mesosternal elevation forming a pentagonal or arrow-head-shaped area, convex transversely. Pl. ix, fig. 11.

Prosternum with a slight trace of carination; elytra with distinctly punctured striæ.....**abdominale.**

Prosternum with a well marked carina, more elevated in front; elytra with rows of punctures.....**cacti.**

Mesosternal elevation continuous with that of the metasternum and gradually narrowed to its apex. Pl. ix, fig. 12.

Prosternum with a well elevated carina, higher in front; elytra with rows of punctures.....**advectum.**

D. abdominale Fab.—Oval, slightly oblong, moderately convex, piceous black, shining. Mouth parts rufo-testaceous, the palpi rather paler. Antennæ testaceous, club slightly darker. Head clearly punctate, more finely and densely on the clypeus. Thorax closely punctate, a little more coarsely than the head. Elytra ten-striate, striæ not deeply impressed on the disc, more deeply at the sides and apex, punctures of striæ coarse, nearly distant their own diameters on the disc, closer and coarser at the sides, intervals flat on the disc, slightly convex at sides and apex, closely punctate, the punctures a little coarser than those of the thorax. Body beneath piceous or brownish opaque. Legs piceo-rufous. Length .18—.20 inch.; 4.5—5 mm.

This insect was recognized by me some years ago as an inhabitant of our fauna by the description given by Wollaston. There does not seem to be an agreement between recent students as to which species Fabricius had before him, and Dr. Sharp (Biol. Cent. Am. i, 2, p. 769), while using the Fabrician name, quoted it in doubt, as well as *insulare* Cast. which, I infer, Bedel considers distinct. While the settlement of such a doubtful point is impossible at this time, I use the name adopted by Dr. Sharp, having used a specimen for comparison with our own sent me by Bedel as *insulare*, which Dr. Sharp considers synonymous with *abdominale*.

The facies of the species is not unlike several of our striate Cymbiodyta, as *dorsalis*. It may be at once known from any other in our fauna by the well impressed and rather coarsely punctured elytral striæ. The prosternum is not carinate in the sense in which it is observed in *cacti* or *advectum*, but is merely obtusely elevated along the middle. The mesosternal elevation seen directly from below is in the form of a broad arrow-head, convex transversely.

The species seems to be native to Brazil, whence it has been spread

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to the Antilles and Mexico, and in the Eastern Hemisphere to Madeira and Madagascar. The specimens seen from our fauna are from Florida and North Carolina.

D. cacti Lec.—Oval, slightly oblong, piceous black, shining. Mouth parts rather dark rufo-testaceous. Antennæ paler testaceous with brownish club. Head closely punctate, more finely in front, usually a small group of coarser punctures on each side of the occiput. Thorax closely and equally, but not coarsely punctate. Elytra punctulate, a little more coarsely but less closely than the thorax, the striæ replaced by rows of coarser punctures not closely placed, these rather coarser and deeper at the sides, sutural stria distinctly impressed on its apical half. Body beneath piceous or brownish, opaque, the middle of the metasternum shining, closely, finely punctate. Mesosternal elevation similar in outline to that of *D. abdominale*, the lower edge on a continuous line with the metasternum. Prosternum carinate, the carina much more elevated in front. Legs pale piceo-rufous. Length .20—.24 inch.; 5—6 mm.

In this species the mentum is rather coarsely and closely punctate, while in *abdominale* it is nearly smooth. The sculpture varies a little in degree, the specimens from the hotter regions of Arizona being somewhat smoother. In nearly all the specimens there will be observed a small ante-basal fovea on the thorax opposite the fourth elytral interval, as in many Cercyon, a faint indication of the same will be observed in *abdominale*.

Occurs in southern California and Arizona under decomposing Cactus, more especially of the more massive forms (Cereus, etc.).

D. advectum n. sp.—Oval, oblong, slightly oblong, piceous black, shining. Mouth parts rufo-testaceous, antennæ and palpi paler. Head not coarsely punctate, moderately closely on the front, densely on the clypeus. Thorax equally punctate over the entire surface, a little more coarsely than the head. Elytra striato-punctate, the punctures of the discal rows finer and distant, those of the outer three rows much coarser and more deeply impressed, the sutural stria moderately impressed from apex nearly half to base, intervals closely punctate, more coarsely than the thorax. Body beneath piceous or brownish, opaque; metasternal area shining, finely punctate. Legs piceo-rufous. Length .18 inch.; 4.5 mm.

The mentum is opaque and punctulate, but less coarsely than in *cacti*, being intermediate between the latter and *abdominale*. The prosternum has a well marked carina, a little more elevated in front, but less so than in *cacti*. The mesosternal elevation is not at all pentagonal, but the sides are gradually divergent from the base to the obtuse apex, the form recalling that seen in Hydrophilus, the lower edge being on the same plane as that of the middle of the metasternum.

Occurs in Florida, special region unknown. This species may

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possibly be an introduced one, but I have been unable to identify it. The Mexican species are certainly all different as the form of mesosternum would not have escaped the acute observation of Dr. Sharp, unless that of *C. posticatum* is similar.

PHÆNOTYPUS n. g.

Mentum broader than long, slightly narrowed posteriorly, slightly convex, sparsely punctate, finely transversely strigose, vaguely emarginate in front. Maxillary palpi moderate, the pseudo-basal joint slightly inflated, terminal joint a little longer than the preceding. Antennæ 9-jointed, terminated by a compact, elongate oval, scarcely flattened club, first joint as long as the club, the intermediate joints together a little more than half that length. Prosternum extremely narrow in front of the coxæ, forming a triangular area at middle which is obtusely carinate. Metasternum slightly elevated along its middle, prolonged between and entirely separating the middle coxæ, meeting the metasternum and closely united with it, the latter forming a pentagonal area. Suture between the metasternum and its episternum very slightly arcuate. First ventral segment carinate at middle. Legs rather short. Tarsi shorter than the tibiæ, rigid; the first joint scarcely longer than the second.

The above generic name is suggested for a species scarcely larger than *Creniphilus subcupreus*, which presents some peculiarities forbidding its reference to any of the genera at present proposed. It would have been referred to Perochthes, but Dr. Sharp asserts that but four joints can be detected in the tarsi.

If I interpret Dr. Sharp's meaning correctly, the antennal club is compact and not loose, as in the family generally; in fact, it resembles in form and appearance the club of a Cuculionide rather than a Hydrophilide.

The meso-metasternal region does not differ greatly from that of Dactylosternum, except that the two parts are more firmly and broadly joined at their line of union, and the metasternal prolongation relatively broader than usual in the Cyclonotum series.

The joints of the tarsi are by no means easy to determine, and from having at one time considered the number of joints four, I am now able to figure the five.

The mesosternal structure will readily separate the genus from Phænonotum, which has also the strongly arcuate lateral suture of metasternum and no ventral carina.

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From Cyclonotum it differs in the very narrow prosternum in front of the coxæ, the compact antennal club and slightly convex mentum. From Dactylosternum it differs in the absence of the carina of the prosternum, the form of the antennal club, the slightly curved lateral suture of the metasternum.

One species is known in our fauna.

P. palmarum Schwarz.—Rather broadly oval, convex, piceous black, shining. Antennæ and palpi pale rufo-testaceous. Head minutely transversely strigose, sparsely punctulate. Thorax minutely alutaceous, sparsely punctulate. Elytra sparsely, obsoletely punctate, the punctures confused without tendency to form rows, sutural stria moderately well impressed from apex one-third toward base. Body beneath opaque. Legs bright rufo-testaceous. Length .07 inch.; 1.75 mm.

Not very different in form from *C. subcupreus*, although less distinctly punctured. The anterior part of the head is usually paler. The sides of thorax and tips of elytra are described as sometimes red, but this is rather a translucency than difference of color.

Occurs at Enterprise, Fla., feeding on the sap of Palmetto.

PHÆNONOTUM Sharp.

Mentum quadrate, a little wider than long, slightly narrowed behind, apex broadly emarginate, lower face concave, more or less punctured. Maxillary palpi moderate in length, the last joint slightly longer than the preceding. Antennæ 9-jointed, the club loosely articulated. Elytra confusedly punctate, without trace of striæ. Prosternum short in front of the coxæ; not carinate between them. Metasternum obtusely elevated along the median line, prolonged between and in front of the middle coxæ, meeting the mesosternal elevation, which forms but a very small part of the intercoxal carina. Tarsi 5-jointed, claws simple.

In addition to the characters given by Dr. Sharp, two others, seemingly of great importance, have been observed. The suture between the metasternum and its episternum is a curved line convex inwardly so that the episternum is narrower at either end than at middle. The first ventral segment is not carinate.

The first of these characters is only indicated in the posterior part of the episternum in *Cyclonotum orbiculare*, and it will be observed at the same time that its first ventral segment is also not carinate. These characters exhibit the intermediate position occupied by *orbiculare* in its relation to Dactylosterum and the present genus, and which is further emphasized by the absence of prosternal carina.

Two species are known in our fauna.

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P. estriatum Say.—Rather broadly oval, strongly convex, piceous black, shining. Antennæ testaceous, club somewhat darker. Mouth parts pale, mentum piceous, sparsely punctate, shining. Head indistinctly, not closely punctate. Thorax very little more distinctly punctate than the head, punctures finer in front. Elytra more coarsely punctured than the thorax, the punctures not distant more than their own diameter, a little finer toward the apex. Body beneath piceous, opaque, metasternal carina shining, sparsely punctate. Legs piceous Length .12—.14 inch.; 3—3.5 mm.

This insect has much the facies of *Cyclonotum orbiculare* Fab., although always smaller and rather broader. The anterior edge of the mesosternal plate is very nearly vertical.

Occurs in Maryland, Missouri, Florida, Louisiana and Texas.

P. semiglobosum Zimm.—Rather broadly oval, semiglobose, piceous black, shining. Mouth parts testaceous, mentum piceous, sparsely punctate, shining. Antennæ testaceous, club brown. Head sparsely indistinctly punctate. Thorax obsoletely, sparsely punctate. Elytra very distinctly punctate, a little more finely at apex, the punctures separated by more than their own diameters. Body beneath piceous, opaque, metasternal carina shining, sparsely punctate. Legs piceo-rufous. Length .10 inch.; 2.5 mm.

This species is very closely related to the preceding, and differs only in some minor details. It is smaller and more convex, the entire surface less distinctly punctate, and on the elytra the punctures are more widely separated.

Occurs in Florida.

Group CERCYONES.

In this group the metasternum is not at all, or extremely little extended between the middle coxæ. The prosternum moderately wide in front of the coxæ and carinate at middle. First ventral segment distinctly carinate. Elytra with distinct lateral edge, the epipleuræ distinct and horizontal. Metasternal side pieces of moderate width, the sides parallel.

The following genera occur in our fauna:

Middle coxæ narrowly separated, the mesosternal elevation usually narrow, the suture between it and the metasternum well marked..... ....**Cercyon.**

Middle coxæ widely separated, the mesosternal elevation forming a rather broad pentagonal area, which is closely united by its broad base with the metasternum, the suture barely distinct ....**Pelosoma.**

In these genera the joints of the antennal club are rather closely articulated. The elytra are usually striate, but a good number have merely rows of punctures. Several genera have been indicated, which may be referred here, but one of them, *Oosternum*, does not seem to me separable from Cercyon. Sphæridium belongs here, but

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is not represented in our fauna, the introduction of the name in our lists is unnecessary, as the finding of a single specimen, and that even doubtful, does not entitle it to admission.

CERCYON Leach.

Prosternum scarcely separating the anterior coxæ, the median line carinate in a variable degree. Mesosternum elevated between and in front of the middle coxæ, its lower edge being either linear, lanceolate or narrowly oval, the suture between the meso- and metasternum being always well marked. Tibiæ spinulose on their outer edge, the front tibiæ entire on the outer edge, except in *littoralis*.

The metasternum does not project at all between the middle coxæ, but forms an acute angle or broadly rounded edge, in accordance with the form of the mesosternum and the width of the latter at base, as will be seen on the figures (Pl. ix, figs. 1 to 6). The mesosternum is entirely free from the metasternum and can readily on dissection be disarticulated without fracture.

In the other genera of the Cercyon series the mesosternum forms a broad plate, its base broad and closely united with the metasternum, the suture being at most an impressed line.

After a study of a typical species of Oosternum, kindly sent me by Dr. Sharp, and to which our *pubescens* belongs, I am unable to realize that there is sufficient grounds for retaining the genus apart from Cercyon. It is true the body of the prosternum is a little more elevated and the carina consequently less prominent than in the majority of Cercyon, but this is merely a variation in degree and not in structure. The mesosternum is not in any manner different from several species of Cercyon, as will be seen by examining those of the *granarius* group.

The characters made use of in the following table are sufficiently evident and easy to be detected by any one possessing a moderate series of the species.

The examination of species for the basal marginal line must be done with some care. When the thorax is somewhat deflexed the basal marginal line of the elytra assumes a position in relation to the base of the thorax that is very deceptive.

The use of the basal punctiform impressions as a means of separating species is of no value. These occur at the base of the median line and opposite the fourth elytral interval and seem to be the last

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survival of the linear impressions of Helophorus, and are homologous with similar impressions, to which attention has been called in Philydrus *et al.*

There is considerable variation in color in nearly all the species, and to an extent which renders it troublesome to distinguish some of them without close reference to the structural characters, which are fortunately well marked, enabling groups to be formed.

In glancing over the list of species it will be a matter of surprise to many that so few of the forms are peculiar to our fauna. It may also be questionable how many of those common to our fauna and Europe have been introduced by means of commerce.

In studying Bedel's recent work (Faune du Bassin de la Seine) a large number of the species are noted as extending their habitat from temperate Europe through the north of Asia and in some instances to Japan. Every one of these has been found on our continent, and a certain number of other well-known European species having occurred leads to the inference that they should also be found in Siberia (*granarius, tristis, depressus*).

It seems to me that but a small number of the species owe their presence in our fauna to introduction by human agency. They appear to be rather members of a circum-polar fauna equally native in either hemisphere, distributed at a time when continental division was less abrupt than in the present geologic era. Many of the species connect directly with the northwestern regions as indicated above, while others seem restricted to the Atlantic; these latter, if any, are the truly introduced species (*melanocephalus, pygmæus, nigriceps, hæmorrhoidalis*). On the other hand it seems probable some of our Pacific coast species (*luniger, fimbriatus, fulvipennis, adumbratus*) occur likewise on the eastern Asiatic coast. In fact, several Japanese species look very like the first two named.

The species at present known to me have been arranged in accordance with the annexed table.

Anterior tibiæ emarginate on the outer edge near the apex, a conspicuous spur below the notch (Pl. ix, fig. 17).
  Sides of thorax slightly sinuate posteriorly; form subdepressed...**littoralis.**
Anterior tibiæ not emarginate (Pl. ix, fig. 16).
  Sides of thorax distinctly sinuate posteriorly; maritime species.....2.
  Sides of thorax regularly arcuate and narrowed from base to apex.
    Elytral intervals flat or slightly convex; species glabrous.....3.
    Elytral intervals alternately subcostiform at apex; surface sparsely pubescent.....14.

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2.—Elytral striæ deeply impressed from base to apex, intervals slightly convex; maxillary palpi stout.....**fimbriatus.**

Elytral striæ not deep; intervals flat.

Form rather broadly oval; striæ fainter at base; elytra almost entirely pale; maxillary palpi stout.....**luniger.**

Form rather oblong; striæ obliterated at apex; elytra dark, pale at tip; maxillary palpi slender.....**depressus.**

3.—Metasternal area limited to the middle of the metasternum (Pl. ix, fig. 2).

Metasternal area extended by an oblique line which is directed obliquely toward the anterior angle (Pl. ix, fig. 1).....12.

4.—Lateral marginal line of thorax extended for a distance along the basal margin. .....5.

Lateral marginal line reaching the hind angles only.....6.

5.—Elytra reddish testaceous, a large oval piceous spot on the suture behind the middle, which extends narrowly to the apex: thorax slightly narrowed at base.....**unipunctatus.**

Elytra entirely rufo-testaceous or somewhat darker; thorax regularly narrowed from base to apex.....**quisquilius.**

6.—Interval between the seventh and eighth striæ normally wide, at least biseriately punctate .....7.

Interval between these striæ narrow and uniseriately punctate.....11.

7.—Species oval, never very convex, head oblique.....8.

Species short, very convex, head vertical; punctuation of the elytral intervals more indistinct than that of the thorax .....13.

8.—Elytra piceous black, with a sharply limited yellowish white space extending along the side toward the base.....9.

Elytra rufo-testaceous, castaneous or piceous, the apex indefinitely paler; sides of thorax paler.....10.

9.—Eighth interval at least biseriately punctulate; mesosternal elevation narrow.

Elytral striæ rather deeply impressed at apex; apical pale region large, always extended to the humeral angle.....**prætextatus.**

Elytral striæ very faint at apex; apical pale region narrower, rarely reaching the humeral angle.....**marinus.**

10.—Elytral intervals distinctly punctulate, nearly equally with the thorax.

Palpi and antennæ piceous; elytra rufo-castaneous, paler at apex. **fulvipennis.**

Palpi and antennæ pale.

Elytra rufo-castaneous, indefinitely paler at apex.....**lateralis.**

Elytra piceous, a common indefinite pale space divided by the suture, near, but not reaching the apex, humeral umbone paler. **indistinctus.**

Elytral intervals scarcely at all punctulate; thorax distinctly punctulate. **adumbratus.**

11.—Color almost entirely testaceous; head, median space of thorax and humeral space piceous.....**variegatus.**

Color piceous, elytra with an indefinite pale space at apex.....**analis.**

Elytral striæ rather feeble; apical pale space sharply limited by an arcuate line and not extending along the side margin; mesosternal elevation oval .....**ocellatus.**

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12.—Thorax without basal marginal line; thorax entirely black.
Elytra piceous, with pale apex, varying to entirely rufo-castaneous; surface distinctly punctulate; palpi and antennæ piceous. **hæmorrhoidalis.**
Elytra reddish, with a large scutellar triangle and humeral stripe piceous. Palpi pale; epipleuræ piceous; elytra very distinctly punctulate. **melanocephalus.**
Palpi pale, last joint piceous; epipleuræ pale; elytra indistinctly punctulate..... **pygmæus.**
Thorax with distinct basal marginal line; thorax paler at the sides; elytra pale, with a transverse piceous band behind the middle; palpi pale. **nigriceps.**

13.—Surface opaque, more or less alutaceous.
Entire surface alutaceous; elytral striæ fine, but reaching the apex, which has a pale spot..... **lugubris.**
Elytra alone alutaceous, the striæ extremely fine and not reaching the apex, which has a pale spot..... **tristis.**
Surface shining.
Elytral striæ deeply impressed, the intervals convex at sides and apex, a sharply defined apical pale spot, which extends narrowly along the sides to base; intervals scarcely distinctly punctulate; body beneath opaque..... **floridanus.**
Elytral striæ moderately deeply impressed and deeper at apex, which has no pale spot, intervals sparsely punctulate; beneath opaque. **granarius.**
Elytral striæ replaced by rows of fine punctures, intervals sparsely punctulate, apex with a rufous space extending slightly along the suture; beneath shining..... **navicularis.**

14.—Pale rufo-testaceous, head piceous; elytral striæ deep, especially at sides and apex; metasternal area not extended..... **pubescens.**

C. littoralis Gyll.—Oblong oval, moderately convex, piceous black, shining, elytra usually with a pale space at apex extending more or less along the side. Antennæ testaceous, club piceous, palpi piceo-testaceous, last joint darker. Head sparsely indistinctly punctate. Thorax transverse, sides arcuate at middle, narrowed at apex and base, hind angles slightly obtuse, no basal marginal line, disc regularly convex, without trace of basal impressions, surface not closely punctate, the punctures finer in front. Elytra striate, the tenth indistinct, striæ deeper at apex and with fine close punctures, intervals slightly convex on the disc, more so near apex, punctulate more finely and closely than the thorax. Body beneath piceous opaque, the metasternal area shining and sparsely punctulate. Prosternum feebly carinate, mesosternal elevation narrowly oval, sparsely punctulate. Legs rufo-piceous. Length .10—.12 inch.; 2.5—3 mm.

Several variations in color have been recorded for this species in Europe, but in the few that I have seen from our coasts very little difference has been observed, except that one specimen with a slightly paler thorax has a pale spot each side of the scutellum. The apical pale spot may be entirely absent. This species is remarkable in

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having the outer edge of the front tibia emarginate near the apex, with a conspicuous spur below the emargination.

The specimens studied have been collected on Coney Island (Roberts) and Magdalen Island (Blanchard). Widely extended on the sea-coast of Europe, extending also into the Mediterranean. Specimens are in Mr. Ulke's cabinet from Illinois, but without designation of locality.

Since the above was written Dr. Hamilton has collected numerous specimens on the coast of New Jersey, at Longport, about equally divided between those having the apical white space and those totally black. It seems probable that other localities will produce variations similar to those observed in Europe.

C. fimbriatus Mann.—Oval, moderately convex, color variable. Antennæ testaceous, club brownish; palpi piceo-testaceous. Head always piceous, shining, moderately closely punctulate, clypeus slightly alutaceous and subopaque Thorax transverse, the sides feebly arcuate, slightly oblique posteriorly, hind angles rectangular, base without marginal line, disc evenly convex, a faint depression at base opposite the scutellum and one each side opposite the base of the fourth stria, surface finely and closely punctate at middle, more coarsely and less closely at the sides. Elytra deeply striate, striæ not punctate, tenth stria scarcely evident, intervals moderately convex, finely and closely punctate on the disc, alutaceous at sides and apex without distinct punctures. Body beneath dark brown or black, opaque, metasternal area shining, punctate. Prosternum carinate; mesosternal carina narrowly fusiform. Legs variable in color from piceo-testaceous to yellowish. Length .10—.12 inch.; 2.5—3 mm.

This species varies considerably, more especially in color, as follows:

Var. *a*.—Upper surface piceous black, moderately shining, sides of thorax pale, either narrowly or widely. Elytra black, the margin and apex yellowish testaceous; at apex the border of the black space is very irregular. Body beneath entirely black.

This form will include very well several of the varieties into which Mannerheim separates the forms.

Var. *b*.—Head black, thorax yellowish, elytra yellowish, with an oblique piceous spot on each near the apex of variable size, the suture at apex narrowly black. Body beneath opaque, black, or dark brown, the metasternal area and metasternal elevation yellow.

Var. *c*.—Head piceous. Color of upper surface entirely yellowish testaceous. Body beneath as in *b*, but with the abdomen paler brown.

The elytral striæ in all the forms end near the base in an abrupt depression. In many specimens, both of the dark and pale forms, the first and second striæ unite at base by an arch, while in others

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these two striæ are as well separated as the others. I can not find that this has any other than a varietal meaning.

The mesosternal elevation varies in form, being quite narrow in most specimens, while in others the lower edge forms a well marked punctured surface about one-third as wide at middle as long.

Occurs along the entire Pacific coast from Alaska to San Diego under sea-weed. Mr. Ulke has some labeled Arizona, but it is difficult to understand how a sea-coast species can occur there.

C. lunigerr Mann.—Elliptical, sub-depressed, piceous, moderately shining, thorax with a small pale spot near the front angles, elytra reddish yellow, with a narrow crescentic transverse space divided by the suture. Antennæ testaceous, club piceous. Palpi piceo-testaceous. Head sparsely indistinctly punctate. Thorax transverse, sides arcuate in front, oblique behind the middle, hind angles rectangular, base without marginal line, disc regularly convex, a vague depression each side slightly in front of the base, opposite the fourth elytral stria, surface moderately closely punctate, a little more coarsely near the sides. Elytra finely striate, the striæ finely punctate, intervals flat, finely and moderately closely punctate on the disc, alutaceous at apex and sides with the punctures indistinct. Body beneath opaque black, the metasternal area shining and sparsely punctate. Prosternum feebly carinate, mesosternal carina long and linear. Legs piceous, the femora sparsely punctate and indistinctly alutaceous. Length .16 inch.; 4 mm.

This species is the largest occurring within our faunal limits and with a more depressed form than *depressus*, which also occurs with us.

The elytral sculpture is remarkable in the fact that the dorsal region is distinctly punctulate in a triangle, which extends from the humeral angles to the lunate spot, while the space beyond to the apex and side is alutaceous with the punctuation very indistinct.

The coloration of the elytra varies notably. The typical form is that in which a narrow crescentic band crosses the suture one-third from the apex, with the concavity forward. This may entirely disappear so that the elytra are pale luteous. From specimens seen in Mr. Ulke's cabinet it is evident that the crescentic band is merely the remnant of a large discal space.

This species seems related to the eastern Asiatic type of forms, there being several species from Japan which I have seen in Dr. Sharp's collection which resemble it.

Occurs from Alaska southward to California, probably a sea-coast species.

C. depressus Steph.—Oval, slightly oblong, sub-depressed, piceous, elytra indefinitely paler at apex. Antennæ testaceous, the club very dark, palpi testaceous, the last joint darker. Head punctate, rather closely at the sides and apex,

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smoother at middle. Thorax transverse, regularly convex, sides arcuate at middle, slightly oblique in front and faintly sinuate posteriorly, the angles distinct, but not acute, basal marginal line wanting, disc punctate, but not closely, a faint impression near the base opposite the 4th elytral stria. Elytra striate, 10th stria entirely wanting, striæ nearly obliterated at apex, finely punctate, intervals flat, sparsely and indistinctly punctate. Body beneath piceous, opaque, metasternal area shining, sparsely punctate. Legs rufo-piceous. Prosternum finely carinate, mesosternal elevation very narrowly fusiform. Length .08—.10 inch.; 2—2.5 mm.

In some of the specimens there is a faint ante-scutellar impression at the base of the thorax, but it is variable in extent and constancy. There seems to be very little variation, except that due to less maturity. One specimen in my cabinet has the first and second striæ united at base by an arch as in some *fimbriatus*.

Specimens have been collected by Mr. Ulke at Piney Point, Md. Two others from California are in my cabinet. In Europe it is widely distributed on the Atlantic and Mediterranean shores.

C. unipunctatus Linn.—Oval, slightly oblong, feebly convex, piceous black, shining, sides of thorax pale; elytra reddish yellow, with an oval, sutural, piceous spot behind the middle, extending narrowly along the suture to apex. Antennæ testaceous, club fuscous, palpi testaceous, last joint piceous. Head moderately closely punctate. Thorax transverse, sides rather strongly arcuate posteriorly, oblique in front, basal marginal line distinct, except at middle; basal impressions very vaguely indicated, surface moderately closely punctate, less so at the sides. Elytra ten striate, striæ punctate, but not closely, a little less deeply impressed at apex, intervals flat, not closely punctulate, the eighth narrow and with a single row of punctures. Body beneath black, opaque, metasternal area shining, sparsely punctate. Prosternum distinctly carinate, mesosternal elevation narrow, closely punctate. Legs rufo-testaceous. Length .12 inch.; 3 mm.

This species shows very little variation. The common piceous spot may vary in size and color, or the pale margin of the thorax may be greater or less. From its coloration this species may be very readily recognized.

Occurs in our fauna in Canada, New England and Middle States, westward to Illinois. It is widely distributed in Europe extending eastward to Siberia.

C. quisquilius Linn.—Oval, moderately convex, piceous, shining, sides of thorax pale, elytra variable from dark rufo-testaceous to nearly piceous. Antennæ and palpi piceous. Head moderately closely, but not coarsely punctate. Thorax transverse, the sides regularly arcuately narrowed from base to apex, the basal marginal line distinct at outer third, ante-basal impressions faintly distinct opposite the fourth stria, surface moderately closely punctate, less closely at the sides. Elytra ten-striate, striæ rather closely punctate, those of the disc indis-

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tinct near base, deeper near apex, intervals flat, moderately closely punctate on the disc, but much more sparsely at sides and apex, eighth interval not narrow, biseriately punctulate. Body beneath opaque, metasternal area shining, punctate. Prosternum distinctly carinate, mesosternal elevation linear. Legs reddish. Length .08 inch.; 2 mm.

The usual color of the elytra is reddish brown, but they may be paler, but from the specimens I have seen from our regions very rarely as pale as in *unipunctatus*. Superficially, the species resembles quite small *hæmorrhoidalis* (nigricollis *Say*), but that species has a basal marginal line and has the metasternal area extended by an oblique line.

Gyllenhal and Erichson considered this species the male of *unipunctatus*, but the form of the thorax and the difference in the eighth elytral interval will readily separate the two.

At the present time specimens are known to me from the Pacific coast alone, from Washington southward to California. In Europe it is widely distributed extending to Siberia and Japan. Its presence on our continent cannot be attributed to commerce as is doubtless the case with *impunctatus* in the Atlantic region.

C. prætextatus Say.—Oval, moderately convex, piceous black, shining; anterior angles of thorax and large sharply defined space at apex of elytra which extends along the margin to the humeri, yellow. Antennæ testaceous, club darker, palpi pale testaceous. Head piceous, shining, often with two small pale spots on the vertex, surface rather closely punctate. Thorax transverse, the sides arcuately narrowing from base to apex, basal marginal line wanting, disc regularly convex, without trace of basal impressions, surface closely and evenly punctate. Elytra ten-striate, striæ slightly deeper near the apex and closely punctate, intervals closely punctate in a large triangular space at base, but much more sparsely near the apex and sides. Body beneath piceous, opaque; metasternal area shining and punctate. Prosternum distinctly carinate, mesosternal elevation rather thick, the sides nearly parallel, punctate. Femora rufo-testaceous, tibiæ and tarsi darker. Length .10—.12 inch.; 2.5—3 mm.

This species exhibits comparatively little variation. The front angles of the thorax are usually tipped with yellow, but sometimes this color extends nearly to base, in which case the pale border is wider in front. The apical pale space of the elytra also varies in extent, but not greatly. The limit between the two colors is very sharply defined, but the line of demarcation is somewhat irregular.

The only species with which this might be confused is *analis*, which will be known by the indefiniteness of the apical pale space and the very narrow eighth interval with but one row of punctures.

Occurs from Canada to Florida and westward to Kansas.

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C. marinus Thoms.—Oval, moderately convex, piceous black, shining; sides of thorax bordered with pale, elytra with yellowish testaceous space, well defined, extending along the side very nearly to the humeral angles. Antennæ piceo-testaceous, club darker, palpi piceo-testaceous. Head moderately punctate, not very closely. Thorax transverse, sides regularly narrowed from base to apex, basal marginal line wanting, lateral ante-basal impressions small, punctiform, surface rather more coarsely and closely punctured than the head, sparser toward the sides and a little finer in front. Elytra ten-striate, striæ punctate and indistinct at apex; intervals flat, closely punctate, more sparsely near apex and coarser at the sides; epipleuræ piceo-rufous. Body beneath opaque black, metasternal area shining, punctate. Prosternum distinctly carinate; mesosternal elevation very narrowly lanceolate. Legs piceo-rufous, the femora darker. Length .10—.12 inch.; 2.5—3 mm.

This species closely resembles *prætextatus*, and would readily be mistaken for it. The apical pale space is equally sharply defined in both species and in *prætextatus* always reaches the humeral angles, but in the present species is nearly always a little shorter. In the larger number of specimens the lateral pale border is narrow and dilates near the apex into the apical space, but in *prætextatus* the border is broad and becomes rapidly broader about one-third from the base. From this it will be seen that our native species has a much larger extent of pale area. It will be observed in *prætextatus* that the palpi and antennæ are pale, while both are piceous in *maritimus*. In *prætextatus* the striæ are deeper and more coarsely punctate and more distinct at apex, while in *maritimus* the striæ are faint at apex, and at the sides the interstrial punctures are nearly as coarse as those of the striæ.

Occurs in British Columbia at Lake Lahache, extending eastward to Dakota. The species is widely distributed in the north of Europe and Asia.

C. fulvipennis Mann.—Oval, moderately convex, piceous black, shining, sides of thorax pale, elytra brownish or piceo-testaceous, sides and apex somewhat paler. Palpi and antennæ piceous, the latter with a darker club. Head rather coarsely and moderately closely punctate. Thorax transverse, sides regularly arcuate, punctured similarly to the head, basal marginal line wanting, lateral ante-basal impressions very indistinct. Elytra ten-striate, the tenth stria represented by a row of punctures, striæ moderately deeply impressed even to apex, rather closely punctate and more coarsely at the sides, intervals flat, closely punctate on the disc near base, but more sparsely at apex and sides. Body beneath black, opaque; metasternal area shining, sparsely punctate. Prosternum distinctly carinate, metasternal elevation linear. Legs rufous. Length .10—.12 inch.; 2.5—3 mm.

This species bears a strong superficial resemblance to *quisquilius*, *hæmorrhoidalis* and *lateralis*. From the first it is known by the ab-

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sence of the basal marginal line, from the second by the absence of the oblique metasternal line. To *lateralis* it is more closely related, and seems to differ only in the darker antennæ and palpi. It seems to be therefore intermediate between *lateralis* and *obsoletus*, the latter having similar palpi, but an entirely black thorax.

Occurs from Alaska southward to Washington and California.

C. lateralis Marsh.—Oval, moderately convex, piceous black, moderately shining, sides of thorax pale, elytra reddish brown, apex somewhat paler. Antennæ rufo-testaceous, club darker. Palpi pale testaceous. Head moderately punctate, not closely nor coarsely. Thorax transverse, regularly arcuate from base to apex, basal marginal line and ante-basal impressions wanting, surface moderately, not closely punctate, although a little variable. Elytra striate, striæ closely punctate, deeper near the apex, intervals flat, more convex at apex, closely punctulate, but more sparsely near the apex, tenth stria not impressed, replaced by a row of punctures. Body beneath black, opaque; metasternal area shining, sparsely punctate. Prosternum distinctly carinate, mesosternal elevation linear. Legs rufo-testaceous. Length .10—.12 inch.; 2.5—3 mm.

This species closely resembles *fulvipennis*, and is usually mixed with it in the specimens examined by me, but it may readily be known by the pale palpi and antennæ. The punctures of the elytra are also rather more distinct and closer than in that species. The sides of the thorax vary in the extent of the pale border. It is also similar to *hæmorrhoidalis*, but the latter has the metasternal area continued by the oblique line.

Occurs in Alaska and the coast regions to California. It is widely distributed in middle and northern Europe, extending to Siberia.

C. indistinctus n. sp.—Oval, moderately convex, piceous black, shining; sides of thorax slightly paler, an indistinct spot on umbone and a transversely oval pale spot near the apex of the elytra, divided by the suture, not reaching the apical margin. Palpi piceo testaceous, last joint piceous. Antennæ entirely pale rufo-testaceous. Head not closely nor coarsely punctate. Thorax transverse, the sides arcuately narrowed to the front, basal marginal line and basal impressions wanting; surface moderately not closely punctate, the punctures finer and more distant at sides and apex. Elytra ten-striate, the tenth feeble, striæ crenately punctate, slightly deeply at apex, intervals flat, moderately closely punctate on the disc, more finely than the thorax; epipleuræ piceo-rufous. Body beneath opaque, black; metasternal area smooth, sparsely punctulate. Prosternum distinctly carinate, mesosternal elevation very narrow. Legs piceo-rufous. Length .10—.12 inch.; 2.5—3 mm.

This species resembles *analis*, but differs in having the eighth interval with two rows of punctures. The subapical pale space of the elytra is always separated from the margin by a dark space, while in *analis* the spot is nearly always marginal. It could not be con-

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founded with any of the forms allied to *hæmorrhoidalis*, as these have the metasternal area continued by an oblique line. The entire antennæ, including the club, are pale rufo-testaceous and will distinguish it from any species with which it could, by any possibility, be confounded.

Occurs at Grimsby, Canada (Pettit), and southward to Pennsylvania (Dietz).

C. adumbratus Mann.—Oval, moderately convex, variable in color from piceo-testaceous to piceous, but with the sides of thorax and elytral apex indefinitely paler. Palpi and antennæ piceo-testaceous, the latter with darker club. Head moderately, coarsely, not closely punctate, smoother at sides and apex. Thorax with sides a little more arcuate in front of the hind angles, basal marginal line wanting, ante-basal impressions very indistinct, disc moderately punctate, punctures finer in front and almost obsolete at the sides. Elytra striate, the tenth obsolete, striæ deeper at sides and apex, those of the disc scarcely visibly punctate, those at sides distinctly so, intervals of the disc almost absolutely smooth, those at sides very indistinctly punctate. Body beneath piceous, opaque; metasternal area shining, punctate. Prosternum distinctly carinate, mesosternal elevation very narrow, but with a distinctly punctate edge. Legs rufo-testaceous. Length .08—.10 inch.; 2—2.5 mm.

This species in its variation resembles several species, notably *lateralis* and *fulvipennis*, but may be at once known from all of them by the almost entire absence of interstrial punctuation.

The color varies greatly, as indicated, and Mannerheim describes it from ferruginous to fusco-piceous. In the curve of the sides of the thorax it resembles *unipunctatus*.

Occurs from Alaska southward to Vancouver and Washington.

C. variegatus Sharp.—Oval, convex, moderately shining, above testaceous, head piceous with a vertical yellow spot, thorax with a broad, median, piceous space, a spot on each side in front, these often confluent; elytra with a short piceous stripe at humerus below the umbone. Antennæ testaceous, club piceous, palpi testaceous. Head shining, moderately closely, but not coarsely punctate. Thorax transverse, the sides regularly arcuate from base to apex, disc regularly convex, a faint trace of an impression near the base opposite the fourth elytral stria, basal marginal line absent, surface moderately, coarsely and closely punctate, smoother near the sides. Elytra finely striate, more deeply near the apex, these faintly and distantly punctulate on the disc, but much more distinctly punctate at the sides, tenth stria nearly absent, intervals moderately closely punctate, except near apex, the eighth interval narrower, and with but a single row of punctures. Body beneath piceous opaque, abdomen sometimes much paler, metasternal area shining, sparsely punctulate. Prosternum feebly carinate, mesosternal elevation linear. Legs pale rufo-testaceous. Length .08—.10 inch.; 2—2.5 mm.

This species seems very consistent in color from my series, and

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Dr. Sharp does not state to the contrary. The thoracic markings give the species somewhat the appearance of pale specimens of *Creniphilus infuscatus*. The striæ are described by Dr. Sharp as being almost impunctate; this is true of those of the disc, but not at the sides. No mention is made of the fact that the eighth interval has but one series of punctures. The fact was observed by Bedel (Faune i, p. 337) in *analis*, but he erroneously states that it is the ninth interval, while in the present species and *analis* it is certainly the interspace between the seventh and eighth striæ.

Occurs at New Orleans, La. Dr. Sharp records it in various places in Mexico, and as far south as Nicaragua.

C. analis Payk.—Oval, moderately convex, piceous black, shining, elytra with an indefinitely limited pale space at apex, which always reaches the apical border. Antennæ testaceous, club pale brown, palpi testaceous. Head moderately coarsely and closely punctate, clypeus smoother. Thorax transverse, sides arcuately narrowing from base to apex, base with faint traces of impressions in front of the scutellum and the fourth elytral stria, the basal marginal line wanting, disc moderately closely punctate, the punctures less dense and less impressed at the sides. Elytra striate, equally from base to apex, tenth stria very distinct, striæ closely, but not coarsely punctate, intervals flat, moderately closely punctate, the eighth interval narrow and with but a single row of punctures. Body beneath piceous, opaque; abdomen often brown; epipleuræ pale, metasternal area shining, rather coarsely punctate. Prosternum distinctly carinate; mesosternal elevation narrow, but not linear. Legs piceous, or rufo-piceous. Length .08—.10 inch.; 2—2.5 mm.

This species may be quite black, varying to brownish, probably from less maturity. The apical pale spot is variable in size, being sometimes quite a narrow border, and from that covering the apical third of the elytra. It does not, however, extend along the side.

From any other of the species with pale apex this may readily be known by the narrow eighth interval, in which there is but a single series of punctures. As specimens occur almost entirely piceous, the epipleuræ and legs are then very dark.

In our fauna this species is known to me from upper Canada, New England States, Pennsylvania, Illinois, Iowa and Louisiana. It is widely distributed in Europe, extending to Algeria and Siberia.

C. ocellatus Say.—Oval, slightly oblong, convex, piceous black, shining; elytra with yellowish white apical space occupying one-third the surface, sharply defined, limited in extent at the side to a point opposite the posterior coxæ, suture piceous to apex. Antennæ testaceous, club darker. Maxillary palpi pale, last joint usually darker. Head comparatively coarsely and moderately closely punctate. Thorax entirely piceous, or with apical angle alone paler, convex;

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sides regularly arcuate from base to apex, surface punctate similarly to the head, base without marginal line or larger punctures. Elytral striæ scarcely at all impressed, but with moderate sized, closely placed punctures, which are equally distinct at apex, the outer rows of punctures coarser and deeper than those of the disc, intervals flat, distinctly punctulate near the base, but less coarsely than the thorax, and at apex very indistinctly, the interval between the seventh and eighth striæ narrow and with a single row of punctures. Body beneath piceous opaque, metasternal area shining, sparsely punctate, distinctly limited. Prosternum distinctly carinate, mesosternal elevation oval, nearly half as wide as long. Legs rufo-testaceous. Length .08 inch.; 2 mm.

This species is closely related to *analis* in many ways, more particularly in the fact that the eighth elytral interval is narrow and has but a single series of punctures. The apical pale space is better defined than in any species in our fauna, being limited in front by a regular arcuate line. In *marinus* and *prætextatus* the pale space is also sharply limited from the piceous, but the edge is somewhat irregular, and the pale tends toward the humeri in a narrow band.

From the descriptions at my command it is not possible to say in what manner this species differs from *bifenestratus* (palustris *Th.*) of Europe, but as Bedel places the latter in the series in which the eighth interval is at least biseriately punctate, it is probable that our species is different.

Three specimens from Michigan and Illinois in Mr. Ulke's cabinet, also from Canada.

C. hæmorrhoidalis Fab.--Oval, moderately convex, piceous; elytra piceo-castaneous, brownish or somewhat paler, the apex usually paler than the disc. Palpi and antennæ piceous, the latter with very dark club. Head rather coarsely and closely punctate. Thorax entirely piceous, the sides regularly arcuate from base to apex, basal marginal line and ante-basal impressions wanting, surface closely punctate; elytra ten-striate, the tenth replaced by a row of punctures, striæ distinct at apex, moderately closely punctate, intervals flat, densely punctulate, more sparsely at the sides and apex; epipleuræ pale. Body beneath black, opaque; metasternal area shining, sparsely punctate and extended by a line directed toward the outer front angles. Prosternum carinate, mesosternal elevation elongate-lanceolate, punctate. Legs piceo-rufous, femora darker. Length .10—.12 inch.; 2.5—3 mm.

This species varies in the color of the elytra from piceous to castaneous, those which I have seen belong to the latter variety, but have usually a narrow dark border along the base, which extends along the suture nearly to apex. The sutural angle of the elytra shows a tendency in many specimens to be slightly prolonged, but this is by no means constant, nor does it have the value which Thomson assigned to it.

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Several species have reddish brown elytra and very closely resemble this, but here the thorax has never a paler border and the metasternal area is prolonged by an oblique line.

This species is the one which has been known by us as *nigricolle* Say, or *flavipes* Fab. In Europe the species and the name have been equally misunderstood by all but the more recent authors, as will be apparent to any one who will seek for a good description of the species under the name adopted.

Occurs in our fauna from Canada and the New England States to North Carolina and westward to Illinois. It is widely distributed in Europe, also in the north of Africa and western Asia.

C. melanocephalus Linn.—Oval, slightly oblong, moderately convex, piceous, shining; elytra rufescent, or pale castaneous, with a triangular piceous space extending from the base two-thirds or more to apex, and a short humeral stripe piceous. Antennæ and palpi pale testaceous. Head indistinctly, not closely punctate. Thorax entirely piceous, sides regularly arcuate from base to apex, basal marginal line and ante-basal impressions wanting, disc rather finely, not closely punctate. Elytra ten-striate, the tenth replaced by indistinct punctures, striæ distinctly impressed to apex and punctate, intervals indistinctly punctulate; epipleuræ piceous. Body beneath opaque black, metasternal area shining, sparsely punctate, obliquely extended to the outer front angle by a line. Prosternum distinctly carinate, mesosternal elevation narrow, but with a distinctly punctate area. Legs pale rufous. Length .08—.10 inch.; 2—2.5 mm.

This species varies in the extent of the piceous triangle of the elytra, which is sometimes quite small and well defined, or covering the greater part of the disc of the elytra.

Smaller specimens resemble *pygmæus*, but are more convex and with a more distinctly punctate surface. In the present species the palpi are entirely pale, while in *pygmæus* the terminal joint is piceous.

Occurs from Canada to Pennsylvania and westward to Missouri. In Europe it is widely distributed, and extends to northern Africa and the north of Asia.

C. pygmæus Illig.—Oval, slightly oblong, piceous black, elytra piceo-rufous, or paler, with a large triangular basal space of variable extent and a humeral stripe piceous. Antennæ piceo-testaceous, club darker, palpi pale testaceous, the last joint piceous. Head distinctly, not closely punctate. Thorax entirely piceous, the sides regularly arcuate from base to apex, basal marginal line and ante-basal impressions wanting, sometimes a small ante-scutellar impression, surface moderately closely, but not deeply punctate. Elytra striate, the tenth very indistinct, striæ punctate and deeper at base, intervals flat, sparsely indistinctly punctate, much more finely than the thorax; epipleuræ pale. Body beneath piceous, opaque; metasternal area shining, punctate, continued by a well elevated line to the anterior angles. Prosternum distinctly carinate, mesosternal

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elevation very narrow, but punctate. Legs pale rufo-piceous. Length .05—.08 inch.; 1.25—2 mm.

This species varies in the manner indicated for *melanocephalus*. The discal space of the elytra may cover fully half the entire area or it may be reduced to an indistinct cloud around the scutellum.

Resembles in general appearance and coloration *melanocephalus*, but is always smaller and with pale epipleuræ. The punctuation of the elytra is much less distinct than that of the thorax.

Widely distributed over the eastern United States from Canada to Maryland. In the eastern hemisphere it is spread throughout Europe, northern Africa and northern Asia. It seems to have a tendency to become cosmopolitan.

C. nigriceps Marsh.—Oval, moderately convex, piceous, shining, sides of thorax indefinitely paler; elytra reddish testaceous, with a common fuscous spot behind the middle. Antennæ and palpi pale testaceous. Head distinctly, not closely punctate. Thorax regularly convex, sides arcuately narrowed from base to apex, basal marginal line distinct at the sides, a slight impression in front of scutellum, surface finely not closely punctate. Elytra moderately deeply striate, the tenth obliterated, striæ relatively coarsely punctate, the intervals slightly convex, scarcely distinctly punctate; epipleuræ pale. Body beneath, opaque black, metasternal area shining, punctate, prolonged by an elevated line to the anterior angles. Prosternum distinctly carinate, mesosternal elevation linear, smooth. Legs rufo-testaceous. Length .05—.08 inch.; 1.25—2 mm.

In many specimens the metasternal area is pale. In the majority of the native specimens examined the median fuscous cloud of the elytra is very indistinct, but when distinct it forms a broadly crescentic transverse band, while specimens often occur with the elytra entirely pale.

From its small size this species cannot be mistaken for any other except, possibly, *pygmæus*, which, apart from color, differs in the absence of a basal marginal line.

In our country this species is widely diffused, and is known to me from Canada to Louisiana and Indiana, also from Los Angeles, Cal. In its distribution in the eastern hemisphere Bedel remarks that it is almost cosmopolitan.

C. lugubris Payk.—Oval, convex, narrower behind, piceous black, subopaque, entire surface finely alutaceous; elytra at apex with a well defined pale space extending along the side margin. Antennæ rufo-testaceous, club slightly darker, palpi testaceous, last joint darker. Head moderately, finely, closely punctate. Thorax piceous, near the side margin indistinctly paler, sides regularly arcuate and narrowed to apex; basal marginal line wanting, a faint basal

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impression opposite the fourth stria, surface more distinctly punctate than the head and more decidedly alutaceous. Elytra finely striate on the disc, more distinctly impressed at sides and apex, the tenth stria wanting, striæ finely punctate on the disc, more coarsely and closely at sides, intervals flat, alutaceous, not distinctly punctate. Body beneath opaque black, metasternal area shining, punctate. Prosternum distinctly carinate, mesosternal elevation very narrowly oval, punctulate. Legs rufo-testaceous. Length .06 inch.; 1.5 mm.

This species resembles *granarius* in having the elytral striæ entire, but differs in its opaque surface and the presence of an apical pale spot. In the last two characters it resembles *tristis*, which has very fine striæ, not distinct at apex.

Specimens in my cabinet from Nevada have the striæ of the disc somewhat more distinct, and consequently more distinctly punctate than those from Canada or others from Sweden, but I can find no reason for separating them as a distinct species.

Occurs in our fauna in Canada and New England States to Maryland, also in California and Nevada. It is widely spread in middle and northern Europe, extending to Siberia.

C. tristis Illig.—Oval, convex, distinctly narrower behind, black, subopaque, alutaceous; elytra with an apical pale space. Antennæ testaceous, with darker club, palpi pale testaceous, the last joint piceous. Head shining, distinctly and moderately closely punctate. Thorax piceous, shining; sides arcuately narrowed from base to apex, basal marginal line and ante-basal impressions wanting; surface relatively coarsely punctate, a little closer at middle than at the sides. Elytra distinctly alutaceous and subopaque, the striæ replaced by rows of fine punctures not closely placed, which are almost entirely obliterated at the sides and apex, intervals flat, obsoletely punctulate near the base only. Body beneath opaque black; metasternal area shining, sparsely punctate. Prosternum distinctly carinate, mesosternal elevation lanceolate, with a distinctly punctate surface. Legs rufo-testaceous. Length .06 inch.; 1.5 mm.

The difference between this species and *lugubris* have already been referred to. In addition, it will be observed that the mesosternal elevation presents a rather larger area than in either that species or *granarius*. The pale space at the apex of the elytra is not strongly defined and extends along the side nearly to base. The epipleuræ are pale in all three species.

Specimens are known to me from Ohio and Michigan, westward to Iowa, Dakota, California, Washington and Nevada. In the eastern hemisphere it occurs from northern Europe to Siberia.

C. floridanus n. sp.—Oval, slightly more narrowed behind, convex, head vertical, piceous black shining; elytra with a well defined apical pale space, which extends narrowly along the side to the humerus. Antennæ rufo-testace-

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ous with darker club; maxillary palpi testaceous. Head moderately, coarsely and closely punctate. Thorax convex, arcuately narrowed from base to apex, the punctuation similar to that of the head, base without marginal line or larger punctures, color piceous, sometimes with the side indistinctly paler. Elytral striæ rather deeply impressed and entire, the inner five scarcely visibly punctate, the outer five gradually more coarsely and deeply punctate to the tenth; intervals slightly convex, especially laterally and at apex, the punctuation scarcely visible; the apical yellowish white spot is sharply defined, but the anterior edge is irregular, it extends along the side margin external to the tenth stria from the middle to the humeri. Body beneath piceous opaque, metasternal area limited, shining, sparsely punctate. Prosternum distinctly carinate; mesosternal elevation narrowly oval, coarsely punctate. Legs rufo-testaceous. Length .08 inch,; 2 mm.

This species falls very naturally into the *granarius* series by its form and convexity. Its entirely shining surface relates it to *granarius*, from which it is readily known by the much deeper striæ and the well defined apical pale space. In the last peculiarity it resembles *prætextatus* and its allies, but differs from them in the comparatively smooth elytral intervals, the punctuation being even less distinct than in *granarius*, so that the contrast between the punctate thorax is probably better marked than in any species of the *granarius* series.

Occurs in Florida.

C. granarius Erichs.—Oval, narrower behind, convex, piceous black, shining. Antennæ and palpi testaceous. Head very distinctly and moderately closely punctate. Thorax entirely piceous, sides arcuately narrowed from base to apex, basal marginal line and ante-basal impressions wanting, surface finely and indistinctly punctate at middle, more coarsely at the sides. Elytra striate, less deeply on the disc, much more deeply at sides and apex, tenth stria wanting, striæ punctate, rather coarsely crenately at sides and apex, intervals flatter on the disc, convex at sides and apex, scarcely perceptibly punctulate. Body beneath opaque black; metasternal area not prolonged. Prosternum distinctly carinate, mesosternal lamina narrowly oval, the lower edge longitudinally concave and distinctly punctate. Legs rufo-piceous. Length .06 inch.; 1.5 mm.

This small species presents nothing special, except a certain resemblance to *Cryptopleurum minutum*, on account of the deeper elytral striæ than the species with which it is associated. It is the *minusculum* Mels. and until now has not been recorded in our fauna under the European name.

Occurs in Massachusetts, Pennsylvania and District of Columbia. In Europe it occurs in France, Germany, Sweden, and probably in other regions whose references have escaped me.

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C. navicularis Zimm.—Oval, narrower posteriorly, piceous black, shining; elytra slightly rufescent at tip and along the suture posteriorly, body very convex. Antennæ and palpi pale testaceous. Head sparsely, finely and indistinctly punctate. Thorax almost absolutely smooth, a few sparse and fine punctures near the sides, these regularly arcuate from base to apex; basal marginal line and impressions absent. Elytra very convex, rapidly declivous posteriorly, the sutural region slightly elevated on the declivity, surface with striæ of very fine punctures, which are, however, more distinct at sides and apex, the interstrial spaces very sparsely punctate. Body beneath piceous, shining sparsely punctate. Metasternal area with a fine, but distinct oblique line. Prosternum distinctly carinate, mesosternal elevation lanceolate, longitudinally sulcate, metasternum in front truncate. Legs rufo-testaceous. Length .06 inch.; 1.5 mm., or a little longer.

Zimmermann describes the species as having a slight bronze reflexion, but I have not observed this. He also states that there are eleven rows of punctures, which is true if the extreme marginal row is counted, but this is usually omitted in the count of discal striæ. In form the species is very convex, the sides of the elytra nearly vertical, in fact slightly clasping the body.

This insect has cost me some trouble, but with the result of leaving it with Cercyon. Two characters are, however, rather at variance with that genus. The metasternum at its junction with the mesosternal elevation is truncate and not acute, as in all other Cercyons examined and the under side of the body is shining and not opaque. The first of these characters is very plainly foreshadowed by *granarius*, which has a similarly shaped mesosternal elevation, although it is flat and not grooved as in the present species.

While the presence of the oblique metasternal line might cause it to be referred to the series under category 2 in the table, I prefer to associate it with the *granarius* series. In any event the shining underside will readily distinguish it from these or any other of our Cercyones.

Occurs from Canada and Michigan southward to the District of Columbia and Louisiana, westward to Kansas. A specimen in my cabinet labeled California, differs only in having the punctures of the striæ better marked.

C. pubescens Lec.—Oval, more attenuate posteriorly, moderately convex, rufo-testaceous, head piceous, surface sparsely pubescent. Antennæ and palpi rufo-testaceous. Head usually piceous, sometimes rufo-testaceous, surface sparsely, finely and very indistinctly punctate. Thorax narrowed in front, sides arcuate from base to apex, a faint basal marginal line and a slight impression opposite the base of the fourth stria, surface slightly rugose, but without punctures. Elytra with nine rather deeply impressed punctured striæ, the intervals

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flat on the disc, convex at apex, and alternately subcostiform, the surface extremely minutely, sparsely punctulate. Body beneath a little darker than above, subopaque, metasternal area shining, sparsely punctate. Mesosternal elevation elongate oval, acute in front, truncate posteriorly. Prosternum rather strongly carinate. Legs rufo-testaceous. Length .06 inch.; 1.5 mm.

This is the smallest species of the genus known to me. The pubescence of the surface is quite sparse and easily removed, so that many specimens seem deprived of it, except on the thorax, where it seems more persistent. The elytral striæ are relatively more deeply impressed than in any other species, and the subcostiform apical intervals are peculiar to it. The mesosternal plate is not very unlike that seen in *granarius*. This form seems to lead from Cercyon slightly to Cryptopleurum, but I can find no valid characters separating it from Cercyon.

Occurs from the Middle States region to Tennessee, often abundantly in dried horse dung.

PELOSOMA Muls.

Prosternum scarcely separating the anterior coxæ, carinate on the median line in front of them. Mesosternum elevated between the middle coxæ in the form of a pentagonal plate (Pl. ix, fig. 8) and rather widely separating them, the base of the pentagon meeting a very short prolongation of the metasternum and very closely united with it. Tibiæ feebly spinulose on the outer edge, the anterior pair entire as in Cercyon.

The above characters seem to indicate the validity of Pelosoma as a genus apart from Cercyon, although most authors since Mulsant have seemed unwilling to admit it. In every other respect the characters are those of Cercyon. It will be observed from the figure (Pl. ix, fig. 25) that the pseudo-basal joint of the maxillary palpus is less pedunculate at base and far less inflated at apex, but this member is slightly variable in Cercyon, and to a degree which makes it unsafe to be insisted upon as a valuable difference.

One species is known in our southwestern regions which Dr. LeConte properly referred to this genus.

P. capillatum Lec.—Regularly oval, convex, piceous black, shining; surface very sparsely pubescent. Antennæ and palpi pale rufo-testaceous. Head rather finely, not closely punctate. Thorax narrowed from base to apex, the sides regularly arcuate, basal marginal line wanting, a faint ante-basal impression opposite the base of the fourth elytral stria, surface sparsely finely punctate, intervals smooth. Elytra with ten series of rather fine, not closely placed punc-

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tures, which are more distinct at the sides, the intervals distinctly punctate in the scutellar region, but very indistinctly or smooth elsewhere. Body beneath piceous, semi-opaque, metasternal area shining, sparsely punctate, mesosternal area coarsely and closely punctate. Legs rufo-testaceous. Length .08—.10 inch.; 2—2.5 mm.

The prosternum is carinate on the median line as in Cercyon.

The pubescence of the surface is very fine, sparse and soft, in most of the specimens not visible and at best rarely seen, except on the sides of the elytra.

In some partly immature specimens the elytra are slightly paler at apex.

Occurs in Arizona and Texas in decomposing Cactus stems.

Group MEGASTERNI.

The elytra clasp the body and are slightly inflexed beneath it, there being no distinct lateral edge and the epipleuræ scarcely discernible. The side pieces of the metasternum are partly covered by the elytra so as to be much narrowed. The middle coxæ are widely separated, almost entirely by a large mesosternal area, which is pentagonal in two genera and oval in a third. Metasternum not or very little prolonged between the coxæ and very closely united with the metasternum the suture scarcely visible. Prosternum at middle elevated to the plane of the mesosternum forming an area differing in shape in the genera. First ventral segment carinate.

The following genera occur in our fauna:

Lateral margin of prothorax not inflexed.
  Anterior tibiæ rather deeply excised on the outer edge near apex. **Megasternum.**
  Anterior tibiæ entire; elytra costate..... **Pemelus.**
Lateral margin of prothorax angularly inflexed; anterior tibiæ entire. **Cryptopleurum.**

Megasternum has not a sharply defined metasternal area, Cryptopleurum has the area extended by a well defined elevated line, while Pemelus has an abruptly impressed area along the posterior margin. The metasternal episternum is completely covered in front, wider posteriorly in Cryptopleurum, wider in front and more covered posteriorly in Megasternum, while in Pemelus it is narrowest at middle and wider at each end.

The species of these genera seem to be the furthest extreme of the Hydrophilide type in both structure and habits.

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MEGASTERNUM Muls.

Prosternum elevated, forming a somewhat hexagonal area, which rather widely separates the anterior coxæ, meeting the mesosternum and having a notch in its posterior margin. Middle coxæ widely separated by a process formed partly of the metasternum and partly by the mesosternum (Pl. ix, fig. 10), the latter being in the form of a broadly pentagonal plate, acute in front, the union between these two sterna being very close, although with distinct suture. Metasternal episternum very narrow, partly covered by the elytra; mesepimera covered. Epipleuræ extremely narrow. Anterior tibiæ deeply notched on the outer edge near the apex, all the tibiæ very feebly spinulose on their outer side. Tibial spurs very inconspicuous even on the front tibiæ.

The characters, otherwise, are as in Cercyon, the palpi in no wise differing, excepting that the last joint is very distintly longer than the penultimate (Pl. ix, fig. 26) and the pseudo-basal joint more inflated than is usual in Cercyon. The tibiæ are broader and flatter than in any of the genera to which it is related.

The genus seems a perfectly valid one. It is represented in our fauna by two species, which may be distinguished in the following manner:

Head and thorax scarcely visibly punctate; elytral striæ fine, but distinct; the intervals scarcely punctate, apex paler.....**posticatum.**
Head and thorax densely punctulate; elytral striæ obliterated, except at the side, surface closely punctate.....**punctulatum.**

M. posticatum Mann.—Oval, slightly narrower behind, convex, piceous black, subopaque, sides of thorax and humeral spot indefinitely paler; elytra at apex distinctly paler. Antennæ rufo-testaceous, club piceous. palpi testaceous, last joint piceous. Head smooth, shining, entirely piceous. Thorax indistinctly paler at sides, these feebly arcuately narrowed from base to apex, basal marginal line absent, a distinct ante-basal impression opposite the fourth stria, sometimes indistinct or wanting, surface smooth, shining, a few sparsely placed, very fine punctures near the side. Elytra finely alutaceous, surface finely striate, striæ deeper near the apex, the punctures of the striæ extremely indistinct at middle of disc, but very obvious at sides and apex, intervals flat, not punctate. Body beneath piceous, slightly shining, metasternal area smooth behind and at its sides, punctate in front, the flanks of the metasternum coarsely punctate. Legs rufo-piceous. Length .08 inch.; 2 mm., a little more and less.

The pale area at the apex of the elytra is always distinct, although its limits are not sharply defined. The umbone may or may not have the pale spot, in the former case the species resembles *Cercyon ocellatus.*

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Owing to the neglect of the species of this tribe this one has been retained in Cercyon, an error very properly corrected by Bedel.

Occurs from Alaska southward to the region about San Francisco.

M. punctulatum n. sp.—Oval, convex, slightly narrowed posteriorly, piceous black, shining. Antennæ and palpi rufo-testaceous, the former with darker club. Head and thorax densely punctulate. Elytra closely punctate, more coarsely than the thorax, the first and second striæ very faintly indicated, the outer three striæ short, distinctly impressed, coarsely punctate. Body beneath piceous, shining, metathorax coarsely, but not closely punctate, the punctures finer posteriorly. Legs rufo-piceous. Length .07 inch.; 1.75 mm.

In its superficial aspect this insect resembles a small member of the Sphæridium series of genera. The punctuation of the greater part of the elytral surface is close and confused, with scarcely any trace of striæ, except at the sides. The differences between this species and *posticatum* are well marked in their sculpture and scarcely need mention here.

One specimen, Bayou Sara, La. Given me by Mr. E. A. Schwarz.

PEMELUS* n. g.

Prosternum elevated between the coxæ and rather widely separating them, forming an irregular quadrate area, which is abruptly narrowed in front, and rather deeply emarginate behind to receive the apex of the mesosternum, on each side of the prosternum in front an oblique tubercular elevation. Mesosternal plate elongate, pentagonal in form, rather widely separating the middle coxæ and prolonged in front into the apex of the prosternum and partly covering the front legs at their base. Metasternum not prolonged between the coxæ, separated from the mesosternum by a very indistinct suture. Anterior tibiæ as in normal Cercyon, without emargination at apex. Characters otherwise as in that genus.

Finding it impossible to associate the species described as *Megasternum costatum* Lec. with any of the genera which have been proposed the above name is suggested. It seems in many respects intermediate between *Cryptopleurum* and *Megasternum*, but lacks the inflexed sides of the pronotum of the former and the deeply emarginate front tibiæ of the latter, at the same time the sternal pieces are quite different from any of the genera which have been proposed.

The oblique line which is prolonged from the metasternal area in several species of Cercyon and other genera, has here its fullest de-

* Name without classical derivation.

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velopment. This line which here extends less obliquely forward limits an area in front, which is coarsely sculptured, from an abruptly depressed area posterior to it, which is comparatively smooth, and with a surface similar to that of the abdomen. The posterior femora when at rest fill the depression.

The elytral sculpture is peculiar in that it consists of well marked costæ alternating in elevation, separated by deep grooves. The elytra clasp the body at the sides, so that more than the epipleural edge is visible from beneath.

P. costatus Lec.—Rather broadly oval, more acute posteriorly, moderately convex, piceous or brownish, subopaque, very sparsely pubescent. Antennæ and palpi pale testaceous. Head densely punctulate and opaque, with scabrous aspect Thorax more than twice as wide as long, sides arcuately narrowed from base to apex, base arcuate at middle, slightly sinuate each side, apex emarginate; lateral margin slightly explanate and slightly reflexed, disc convex, median line rather deeply sulcate, limited each side by a vague costa, a vague oval depression at base each side of sulcus, exterior to which are two very vague, oblique costæ, near the margin a more distinctly elevated costa parallel with the margin, the surface closely punctate and scabrous. Elytra deeply sulcate, and with rather coarse punctures closely placed, the intervals acutely subcostiform, the alternate intervals 2-4-6-8 more strongly elevated. Body beneath in color as above. Mesosternal plate coarsely cribrate, the margins smoother. Metasternum coarsely punctate, cribrate; behind the mesosternum and at the sides, a small depressed area along the posterior margin much smoother. Legs rufo-testaceous. Length .05—.07 inch.: 1.25—1.75 mm. (Pl. ix, figs. 14 and 15)

This is one of the smallest members of the tribe. Its aspect is rather that of a Colydiidæ than an ally of Cercyon from the style of elytral sculpture. In some specimens the alternation of the elytral intervals in elevation is very well marked in their entire extent, while in others it is evident near the apex only. The thoracic sculpture is more vague than is represented in the figure, but is variable in distinctness.

Occurs in the District of Columbia and Tennessee.

CRYPTOPLEURUM Muls.

Prosternum elevated in front of the coxæ, forming a rather large pentagonal area, extending between and rather widely separating the coxæ, the apex notched to receive the point of the mesosternum. Mesosternum forming a broad pentagonal plate widely separating the coxæ and closely united with a broad process of the metasternum. Metasternal episterna in great part concealed in front by the elytra. Epipleuræ scarcely distinct. Tibiæ rather broad and thin, the spurs

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small, outer edge feebly spinulose. Anterior tibiæ not emarginate; maxillary palpi with the pseudo-basal joint slender at base, inflated at apex, last two joints slender, the terminal slightly longer than the preceding.

On viewing the body from below it will be observed that the thorax has angulate sides, but the angle is reflected inferiorly and not at all visible from above. The metasternal oblique line illustrates here in its full development what is scarcely more than indicated in several of the species of Cercyon.

But two species are known to me, one of which has been introduced from Europe.

Elytral striæ not conspicuously coarsely punctured; intervals punctate in their entire extent; metasternum densely punctate.....**minutum.**
Elytra striæ conspicuously coarsely punctured at base; intervals at sides and apex nearly smooth; metasternum not densely punctate..**americanum.**

C. minutum Fab.—Rather broadly oval, more narrowed behind than in front, convex, piceous black, feebly shining, elytra with pale tip. Antennæ and palpi piceous. Head finely and closely punctate. Thorax, as seen from above, narrowed from base to apex, the sides feebly arcuate, basal marginal line wanting, a faint impression opposite the fourth stria, surface rather closely punctate. Elytra moderately deeply striate, striæ punctate, intervals slightly convex, rather closely punctulate and sparsely pubescent. Body beneath piceous, moderately shining. Metasternal area sharply limited by a well-elevated, sinuous, oblique line, which extends from the anterior outer angles to the coxal articulation, the entire surface of the metasternum very coarsely and rather closely punctate. Mesosternal area opaque, moderately densely punctate. Legs piceo-rufous, femora darker. Length .06—.08 inch.; 1.5—2 mm.

The pale region at the apex of the elytra is very indefinite, and may extend so as to leave only a triangular scutellar space black, as in many *Cercyon pygmæus*, or the elytra may be entirely pale. There is often a pale spot on the umbone. The pubescence of the surface is very easily removable, so that but few specimens show it, and then only when recently captured.

Occurs in the New England States, Canada, and as far south as Maryland. In Europe it is widely distributed, extending to Siberia, the Amur region and Japan. From the latter distribution it should be found on the Pacific coast.

C. americanum n. sp.—Rather broadly oval, convex, piceous black, shining, elytra at apex paler. Antennæ and maxillary palpi pale rufo-testaceous. Head finely and closely punctate. Thorax arcuately narrowed from base to apex, the sides angularly inflexed, surface more coarsely punctate than the head, especially at base and sides, more finely at apex. Elytra rather deeply striate, striæ

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coarsely and closely punctate near the base and gradually more finely to apex; intervals convex, moderately coarsely punctate from the base beyond the middle, but comparatively smooth at apex and sides. Body beneath moderately shining, the metasternum coarsely and moderately closely punctate. Legs rufo-testaceous Length .07 inch.; 1.75 mm.

This species resembles, superficially, *minutum*, but differs in some important details. The sculpture of the head and thorax is similar. The elytra are somewhat more deeply striate and the punctures much coarser, while the punctuation of the intervals is less close and less extended. In *minutum* the metasternum has a well marked oblique line, and the surface otherwise is densely coarsely punctate, in the present species the line is less marked and the punctuation well separated.

The pale apical region which extends along the sides to middle may not be specific, but varietal. There is no pubescence visible on the unique examined.

One specimen collected in Ross County, Ohio, was kindly given me by Mr. E. A. Schwarz.

The following species belongs to the tribe, but has not been positively identified:

Cybocephalus? unicolor Motsch., Bull. Mosc. 1845, iv, p. 364.—Ovatus, convexus, puntatissimus, fulvus, nitidus, palpis longissimis; thorace transverso antice angustato, lateribus arcuatis; elytris crenulato-striatis; tibiis externe spinosis. Long. 1 ligu.; larg. ⅔ ligu.

Il resemble beaucoup à une *Anisotoma*, mais il est pentamère. De Sitka.

Mannerheim states that this is probably a Cercyon (Bull. Mosc. 1853, iii, p. 110), and the description to me reads very like that of *Cryptopleurum minutum* when immature.

Before closing the present paper I desire to express my thanks to those who have kindly assisted its progress by either valuable suggestions or specimens. Messrs. Liebeck and Wenzel, associates of our Section; Dr. Dietz, of Hazleton; Blanchard, of Lowell; Dr. Hamilton, of Allegheny; and finally, but by no means least, Ulke and Schwarz, of Washington.

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Bibliography and Synonymy.

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D. **abdominale** Fab., Ent. Syst. i, p. 79.
Rousseti (Dactylost.) Woll. Ins. Mad. p. 100, pl. 3, fig. 1.
insulare (Cœlostoma), Cast. Col. ii, p. 59.
D. **cacti** Lec., Proc. Acad. 1855, p. 373.
D. **advectum** n. sp.

PHÆNOTYPUS n. g.

P. **palmarum** Schwarz, Trans. Am. Philos. Soc. 1878, p. 355.

PHÆNONOTUM Sharp.

P. **estriatum** Say, Bost. Journ. i, p. 171; edit. Lec. ii, p. 646.
P. **semiglobosum** Zimm., Trans. Am. Ent. Soc. 1869, p. 250.

CERCYON Leach.*

C. **littoralis** Gyll., Ins. Suec. i, p. 111; Muls. Palpic. p. 172; Thoms., Skand. Col. 2, p. 104.
C. **fimbriatus** Mann., Bull. Mosc. 1852, ii, p. 344.
C. **luniger** Mann., Bull. Mosc. 1853, iii, p. 168.
C. **depressus** Steph., Illust. Brit. Ent. ii, p. 138.
dorsostriatus Thoms., Skand. Col. ii, p. 104.
C. **unipunctatus** Linn., Faun. Suecc. No. 470; Muls. Col. Fr. p. 164; Thoms., Skand. Col. ii, p. 109.
C. **quisquilius** Linn., Fauna Suecc. No. 397; Muls. Col. Fr. p. 166; Thoms., Skand. Col. ii, p. 108.
C. **ocellatus** Say (*occalatum* err. typ.), Journ. Acad. v, p. 190; edit. Lec. ii, p. 294.
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C. **marinus** Thoms., Skand. Col. ii, p. 105.
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C. **lateralis** Marsh., Ent. Brit. i. p. 71.
limbatus Mann., Bull. Mosc. 1843, ii. p. 260.
C. **indistinctus** n. sp.
C. **adumbratus** Mann., Bull. Mosc. 1843, ii, p. 260.
C. **variegatus** Sharp, Biol. Cent. Am. 1, 2, p. 107, pl. iii. fig. 13.
C. **analis** Payk., Fauna Suec. i, p. 187; Muls., Col. Fr. p. 183.
maculatus Mels., Proc. Acad. ii, p. 101.
C. **hæmorrhoidalis** Fab., Syst. Ent. p. 67; Muls., Col. Fr. 159; Thoms., Skand. Col. ii, p. 107; *flavipes*, Fab. et al.
nigricollis Say, Journ. Acad. v. 190; edit. Lec. ii, p. 294.
C. **melanocephalus** Linn., Faun. Suec. No. 425; Muls., Col. Fr. p. 178.
nanus Mels. Proc. Acad. ii, p. 102.
C. **pygmæus** Illig., Mag. i, p. 40; Muls., Col. Fr. p. 170; Thoms, Skand. Col. ii, p. 109.
apicalis Say, Journ. Acad. iii, p. 204; edit. Lec., ii, p. 130.

* As the great majority of the species occur in Europe, but few references are given, and no synonymy, except when it enables a reference to a good description to be cited.

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C. nigriceps Marsh., Ent. Brit. p. 72.
centrimaculatus Sturm., Ins. ii, p. 23, pl. 22, fig. E; Muls., Col. Fr. p. 169; Thoms., Skand. Col. ii, p. 109.
mundus Mels., Proc. Acad. ii. p. 101.
C. lugubris Payk., Faun. Suec. i, p. 59; Muls., Col. Fr. p. 181; Thoms., Skand. Col. ix, p. 125.
C. tristis Illig., Mag. i, p. 109.
minutus Muls.; Thoms., Skand. Col. ii, p. 106.
C. floridanus n. sp.
C. granarius Erichs., Kaef. Mark. Brand. i, p. 221.
C. navicularis Zimm., Trans. Am. Ent. Soc. ii. p. 250.
C. pubescens Lec., Proc. Acad. 1855, p. 374.

PELOSOMA Muls.

P. capillatum Lec., Proc. Acad. 1855, p. 374.

MEGASTERNUM Muls.

M. posticatum Mann., Bull. Mosc. 1852, ii, p. 354.
M. punctulatum n. sp.

PEMELUS n. g.

P. costatus Lec., Proc. Acad. 1855, p. 374.

CRYPTOPLEURUM Muls.

C. minutum Fab., Syst. Ent. p. 68.
atomarium ‡ Oliv., et auct. plur.
vagans Lec., Proc. Acad. 1855, p. 375.
C. americanum n. sp.

DESCRIPTION OF PLATE IX.

Fig. 1.—Meso-metathorax of *Cercyon hæmorrhoidalis.*
" 2.— " " *C. fimbriatus.*
" 3.— " " *C. granarius.*
" 4.— " " *C. analis.*
" 5.— " " *C. fulvipennis.*
" 6.— " " *C. navicularis.*
" 7.— " " *Cryptopleurum minutum.*
" 8.— " " *Pelosoma capillatum.*
" 9.— " " *Pemelus costatus.*
" 10.— " " *Megasternum posticatum.*
" 11.— " " *Dactylosternum cacti.*
" 12.— " " *D. advectum.*
" 13.— " " *Phænonotum estriatum.*
" 14.—*Pemelus costatus.*
" 15.— idem. lateral view.
" 16.—Front tibia of *Cercyon fimbriatus.*
" 17.— " *C. littoralis.*
" 18.— " *Pelosoma capillatum.*
" 19.— " *Megasternum posticatum.*
" 20.—Antenna of *Dactylosternum cacti.*
" 21.— " *Cyclonotum orbiculare* (European).
" 22.— " *Cercyon luniger.*
" 23.— " *Phænotypus palmarum.*
" 24.—Hind leg of *P. palmarum.*
" 25.—Maxillary palpus of *Pelosoma capillatum.*
" 26.— " " *Megasternum posticatum.*
" 27.— " " *Cercyon hæmorrhoidalis.*
" 28.—Antenna of *Creniphilus degener.*

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MAR 3 1897

New North American bees of the genera HALICTUS and PROSOPIS.

BY CHARLES ROBERTSON.

The following descriptions are of species of bees which I have taken on flowers in Illinois, and for which I need names. Through the kindness of Mr. E. T. Cresson, I have had an opportunity to examine the specimens of *Halictus* contained in the collection of the American Entomological Society, so that the descriptions were made from an examination of specimens from different parts of the country. I have endeavored, as far as I was able, to describe the species so as to be easily distinguished from nearly related species both described and undescribed. The types will be found in the collection of the American Entomological Society.

Halictus Forbesii ♀.—Black, clothed with dull yellowish pubescence; head broader than high, clypeus not produced; antennæ black; mesothorax a little shining, rather coarsely and closely punctured, scutellum sparsely punctured; metathorax not truncate, the semicircular disc bordered by a sharp edge and bearing irregular radiating rugæ, which reach the posterior margin; abdomen finely punctured, segments 2–4 with a broad band of whitish pubescence at base; wings hyaline, nervures dull honey-yellow; tegulæ black, with a testaceous dot; hindmost tibial spur long, with many short, mostly blunt teeth. Length 8—9 mm.

♂.—More shining; face triangular, cheeks short, labrum with a median notch, tips of closed mandibles hardly surpassing the clypeus, anterior half of clypeus pale yellow, disc of metathorax with few radiating lines; wings with the nervures darker than in ♀, the tegulæ sometimes paler; all of the tarsi pale yellowish white. Length 7—9 mm.

Hab.—Illinois; four ♀, two ♂ specimens. Closely resembles *H. cortaceus* Sm. (= *subquadratus* Sm. ♂), but the metathorax is rougher; the ♀ is distinguished by being a little more shining, the clypeus less produced; the ♂ by its more triangular face, shorter mandibles and cheeks, and pale tarsi. Dedicated to Professor S. A. Forbes.

Halictus pectinatus ♀.—Black, clothed with a thin whitish pubescence clypeus produced; antennæ black; mesothorax shining, finely and sparsely punctured; metathorax with a poorly defined truncation, which slopes towards insertion of abdomen; disc small, rounded laterally and toward the truncation, a little rough at base, smooth and shining beyond; abdomen not fasciate, shining and sparsely punctured on first segment, second segment densely punctured,

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third and fourth with a little bluish reflection; wings hyaline, nervures fuscous; tegulæ black, with a testaceous spot; hindmost tibial spur long, thickly set with fine teeth. Length 8 mm.

Hab.—Illinois; one specimen.

Halictus nelumbonis ♀.—Black; clypeus slightly produced; mesothorax thinly clothed with blackish pubescence, coarsely and densely punctured, the punctures confluent into coarse reticulations on the sides; scutellum more finely punctured; metathorax hardly truncate, clothed with long, feathery hairs, the surface obscured by a sericeous tomentum, the disc bearing a triangular enclosure, which is rugose and shining, in strong contrast with the hairy portion; abdomen shining, impunctate, segments 2 and 3 with faint indications of interrupted basal fasciæ of pale pubescence; wings hyaline, or a little clouded, nervures fuscous; tegulæ black, punctate; posterior tibial spur with four or five teeth, the basal ones longest. Length 7—8 mm.

♂.—Closely resembles the female; antennæ hardly longer; mandibles, except tips, testaceous; labrum emarginate; abdomen, impunctate tegulæ and legs, inclining to brownish. Length 6—7 mm.

Hab.—District Columbia, Florida. Illinois, Wisconsin (Trelease); thirty-four ♀, two ♂ specimens.

This bee prefers flowers of *Nymphæaceæ*, which seems to account for its being overlooked. I have taken it on flowers of *Nuphar*, *Nymphæa* and *Nelumbo*, in Illinois, and on *Nuphar* and *Nymphæa* in Florida. Prof. Trelease found it on *Nuphar* in Wisconsin. The American Entomological Society's collection contained only the two males from District of Columbia.

Halictus 4-maculatus ♀.—Black, shining; head broad, eyes prominent, clypeus hardly produced; mesothorax finely and rather sparsely punctured; scutellum sparsely punctured; metathorax rounded, the disc short, sloping, with longitudinal rugæ at base, smooth beyond: abdomen impunctate, bases of segments 2 and 3 with a patch of appressed white pubescence on each extreme side; wings hyaline, nervures fuscous, or dull honey-yellow, second cubital cell strongly narrowing to the marginal, the first recurrent nervure commonly uniting with the second transverse cubital; tegulæ more or less testaceous: posterior tibial spur with four or five long teeth. Length 5—6 mm.

♂.—Resembles the female; form not slender; head large; antennæ little longer than in female; metathorax a little rougher; clypeus anteriorly, labrum, mandibles, except tips, tegulæ, tibiæ, except a patch above and beneath, and tarsi, pale whitish, or testaceous. Length 5 mm.

Hab.—Connecticut (Patton), Tennessee (Aaron), Illinois; fourteen ♀, one ♂ specimen. The female is apt to be confused with that of *H. gracilis*, but may be distinguished by the descriptions.

Halictus gracilis ♀.—Black, opaque; clypeus produced; mesothorax closely and minutely punctured; metathorax hardly truncate; the disc with irregular longitudinal striæ, sometimes uniting in coarse reticulations, at apex

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smooth and somewhat elevated; abdomen shining, without patches of appressed white pubescence; wings hyaline, nervures dull testaceous, the second cubital cell not strongly narrowed to marginal; tegulæ testaceous; posterior tibial spur with three or four long teeth. Length 6—7 mm.

♂.—Slender; a little more shining; antennæ long, testaceous beneath; disc of metathorax more elevated at apex; clypeus anteriorly, labrum and mandibles, generally, pale yellow; knees, sometimes, and tarsi honey-yellow; nervures fuscous; tegulæ black, or testaceous. Length 5—6 mm.

Hab.—New Hampshire, Illinois, Nevada, California; twenty ♀, twelve ♂ specimens. Closely resembles *H. 4-maculatus.*

Halictus palustris ♀.—Blue-green, especially the head and thorax, clothed with long, thin, white pubescence; head broad, clypeus not produced; mesothorax strongly, not closely punctured; metathorax short, broad, strongly truncate; truncation smooth; disc rough, with irregular longitudinal rugæ, bounded posteriorly by a salient rim; abdomen shining, finely and sparsely punctured, clothed with whitish pubescence, except on the discs of the first two or three segments; apical margins of segments rather broadly testaceous; wings whitish hyaline, nervures testaceous, often pale; tegulæ brown, punctured; legs brown or fuscous. Length 6—8 mm.

♂.—Resembles the female; antennæ long, more or less testaceous beneath; metathorax rougher, the disc with the salient rim forming a semicircular enclosure; abdomen less greenish; tarsi pale testaceous. Length 6—8 mm.

Hab.—New Hampshire, Massachusetts, Connecticut, New York, Maryland, District of Columbia, Tennessee, Illinois; thirty-nine ♀, twenty ♂ specimens. Easily recognized by its metathorax and punctured tegulæ.

Halictus Cressonii ♀.—Head and thorax green, abdomen black: head broad, clypeus not produced; mesothorax strongly punctured, clothed with thin fulvous pubescence; metathorax blue-green, narrow, strongly truncate; truncation with superior lateral angles salient; disc rough, with coarse reticulations; abdomen shining, almost impunctate, apical margins of segments hardly testaceous, triangular patch on each side of base of second, and whole of remaining segments with close, pale fulvous pubescence; wings yellowish hyaline, tegulæ and nervures honey-yellow, second and third submarginal cells of about equal width. Length 6—7 mm.

♂.—Resembles the female; antennæ black; metathorax less strongly truncate; tegulæ and nervures darker; tarsi honey-yellow. Length 5—6 mm.

Hab.—Canada, Maine, Massachusetts, Connecticut, New York, Illinois, Montana, Washington; twenty-three ♀, two ♂ specimens. Dedicated to Mr. E. T. Cresson.

Halictus albipennis ♀.—Head and thorax greenish, abdomen brownish; clypeus produced; mesothorax coarsely and rather sparsely punctured, clothed with thin white pubescence; metathorax not sharply truncate, disc with longitudinal rugæ, slightly elevated posteriorly; abdomen depressed, shining,

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almost impunctate, apical margins of segments narrowly testaceous, the whole with close whitish pubescence, except discs of first and second; wings white, hyaline, nervures very pale; tegulæ honey-yellow. Length 5—6 mm.

♂.—Resembles the female; mandibles at tips, antennæ beneath, knees and tarsi, testaceous. Length 5 mm.

Hab.—Illinois; ten ♀, one ♂ specimen.

Halictus tegularis ♀.—Head and thorax dark green, sometimes with a brassy reflection, abdomen brown; flagellum at tip beneath, testaceous; mesothorax rather strongly and closely punctured; metathorax rounded, not strongly truncate, the disc with irregular rugæ not reaching posterior margin; abdomen shining, thinly clothed with pale pubescence, apical margins of segments more or less testaceous; wings hyaline, nervures honey-yellow; tegulæ large, black, pubescent, strongly punctured. Length 4.5—5.5 mm.

♂.—Resembles the female, abdomen more strongly punctured, antennæ testaceous beneath. Length 4 mm.

Hab.—Connecticut, District of Columbia, Illinois, Montana, California, Mexico; thirty-one ♀, two ♂ specimens. Easily distinguished by its small size and strongly punctured tegulæ.

Prosopis nelumbonis ♀.—Head and thorax closely punctured with coarse shallow punctures; clypeus long, finely roughened, with shallow depressions; base of metathorax rough, with coarse reticulations; abdomen impunctate, smooth and shining, especially the first segment. Insect black, clothed with a thin whitish pubescence; triangular mark on each side of face, tubercles and spot on tegulæ in front, yellow; abdomen with the first and base of second segment rufous; legs black, base of tibiæ yellow, extending to the middle on posterior pair; hind tarsi fulvous. Length 6.5 mm.

Hab.—Illinois. Four specimens, taken on flowers of *Nymphæa reniformis* and *Nelumbo lutea*.

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A CONTRIBUTION TOWARD A KNOWLEDGE OF THE MOUTH PARTS OF THE DIPTERA.

BY PROF. JOHN B. SMITH.

"The mouth parts of Diptera are wholly suctorial, and differ from those of the Lepidoptera in that all the component parts may be brought into use. They differ not a little, however, in different flies, as might be supposed from their diverse habits. In some they are adapted for piercing animal or vegetable substances, and are, in consequence, firmer and more slender; in others, and by far the greater number, they are adapted only for sucking up juices or such substances as may be dissolved by means of their saliva. Grains of pollen have been observed in the digestive organs of the Syrphidæ, and other flower flies, but, as a rule, fluids alone serve as food. Many have the proboscis wholly retractile into the oral cavity, and furnished with one, or even two hinges, by which, when at rest, it may be folded up. In others the proboscis is not retractile, and either projects in front, or backwards under the abdomen. While it is usually short, it may be as long or longer than the body. Finally, a few species have the mouth parts rudimentary, and take no nourishment in the adult stage.

"The different parts consist of the labium, the maxillæ, maxillary palpi, mandibles, hypopharynx and labrum-epipharynx, a term used by Dimmock, to whom our clearest knowledge of the mouth parts of Diptera is due. The labial palpi are thought to be wholly wanting. The labium is always present, more or less fleshy, and provided with muscles, and is grooved or channelled upon the upper side to receive the other parts in a sheath completed by the labrum. At its tips there is a pair of joints called the labellæ. In the mosquito these are small, where they serve simply to guide the piercing portion between them, the labium itself being bent backward beneath the thorax in its middle. Very often they are large and more fleshy, and on the inner sides have a roughened surface composed of the pseudo-trachea, which, as in the house-fly, serve as a means of attrition. The maxillæ and mandibles are frequently absent, the latter most often; when present they are slender and bristle like. The maxillary palpi are always present, and consist of from one to five

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joints, in the latter case often long and whip like; they are more or less hairy, and are attached near the base of the proboscis on the outer side, where the maxillæ coalesce with the labium. In addition to the two pairs of maxillæ and mandibles there is a third, unpaired organ which is free, the hypopharynx. It is usually present, and tube like, for the passage of saliva, the outlet being near the tip on the upper side; its tip may be smooth, lance like, or hairy. Its upper side is continuous with the under side of the pharynx, and the whole, or in part, may coalesce with the labium below. Finally, the largest, except the labium and uppermost, as well as the most important organ is the labrum-epipharynx, which is deeply channelled on the under surface and converted into a canal by the apposition of the hypopharynx below. It is through this channel that all the substances used as food must pass. The two parts of which this organ is composed, the labrum above and the epipharynx below, are sometimes separable by means of caustic potash, but are never so in life. It may terminate in a single point, or in several minute ones, as in the mosquito. It forms, as before stated, a covering to the channel in the labium, and may be separable at the will of the insect, as is readily seen in the mosquito when biting, or it may remain tightly closed, as in the house-fly."

The above quotation, from Dr. Williston's article in the "Standard Natural History," is given as representing more clearly and definitely than any other, an account of the present state of our knowledge of the structure of the Dipterous mouth. Kraepelin's studies have made some few modifications, but none in essentials, except that he says there is no epipharynx, and Dr. Packard's most recent text books give practically the same account. To this must be added that Dr. Macloskie calls the chitinous enclosure of the muscid proboscis, above the labellæ, the operculum, and the chitinous frame work at the base of the mouth system, the fulcrum. This latter he considers as a modified endocranium, and the function as a sucking stomach.

As a result of my own studies, I have concluded that the mandibles are present only in the rarest instances; that the proboscis and its labellate development have nothing to do with the labium, but are maxillary developments; that the labial palpi are traceable as rudiments in many forms, and that neither labrum, epipharynx, nor hypopharynx enter at all into the composition of the functional mouth parts of the Diptera!

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This means, practically, that all previous investigators had completely misunderstood the nature of the Dipterous mouth, and puts me to a strict proof of my assertions. To do this it may be useful to state how I, not a special student in the Diptera, reached this conclusion.

In a study of the "Horn fly," *Hæmatobia serrata*, the mouth parts were examined and figured, to show how the "biting" was done. The nomenclature adopted, agreed with that above given by Williston. To illustrate some lectures and papers during the Winter of 1889-90, several carefully prepared slides were required, and, among others, the Dipterous mouth was well represented. Finally, during the Summer of 1890, a lecture on the mouth structure of insects, prepared as a part of a course delivered at the Cold Spring Laboratory of Biological research, brought to my mind very forcibly, the want of agreement in the line of development, for the mandibulate and haustellate series. A number of diagrams, prepared to illustrate these lectures, and now adorning the walls of my laboratory, brought me to a gradual comprehension of the homology which I am now trying to prove.

To understand exactly the line of investigation, it becomes necessary to look for a moment, at the structure of the mandibulate mouth. A generalized view is given by Newport's figure of *Andrena*, which is here reproduced in order to fix the comparative location of the parts, and without any guaranty of correctness in detail. We find the mandibles at the extreme side of the mouth, next the clypeus, and above the labrum, which forms a frontal cover or shield, to the base of the mouth parts. The maxillary palpi are below and within; between the mandibles and the maxillæ. Central, is the labium with its development of ligula, paraglossa and palpi. The mandibles have no point of attachment to either maxilla or labium. The labium is called the lower, the maxilla the upper jaw, but practically, in many cases, the two are on the same plane, and, quite frequently, the labial appendages are before or concealed in part by the maxillary development.

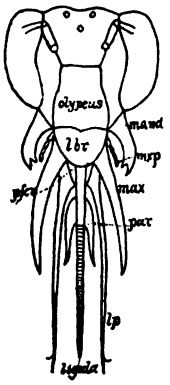

Fig. 1. Head of *Andrena*. After Newport.

The maxilla, illustrated by a species of *Polistes*, probably *metricus* Say, is composed of the cardo, the stipes, the subgalea, the lacinia,

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the galea, the palpifer and palpus, all of which are shown in the figure.

The galea is often palpiform, and in that case the lacinia becomes developed into a scraping or brushing organ, sometimes adding a digitus, but perhaps more usually, the galea is the most developed organ, and is formed as the brush, while the lacinia is reduced as in *Polistes*, or, still more obviously, in *Macrodactylus*, where it becomes a mere rudiment, while the galea becomes highly developed. To this development of the galea, the facts that it is two jointed, and that it tends to form processes or specialized hairs and bristles, particular attention is drawn.

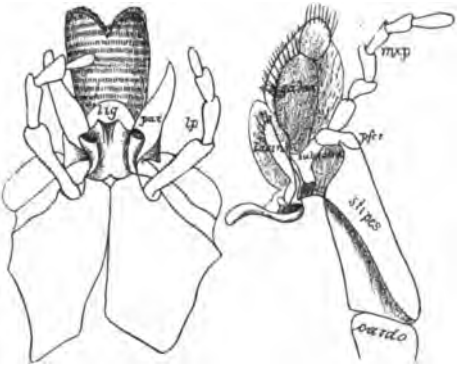

Fig. 2. Mouth parts of *Polistes metricus*.

The labium in its simple form, consists of a central ligula, which is rarely paired, lateral paraglossæ, and the labial palpi, all of which are attached to the mentum. Neither ligula nor paraglossæ are usually jointed, except perhaps, in the Orthoptera. Often they are united to form a single organ, the ligula, practically imbedded in the united paraglossæ. In the *Apidæ*, or many of them, the ligula becomes elongated, ringed, but not jointed, the paraglossæ become enveloping membranes for a portion of the distance, and the palpi also become elongated as the figure of *Andrena* shows. To the peculiar labial development in *Macrodactylus*, attention is here called, but this will

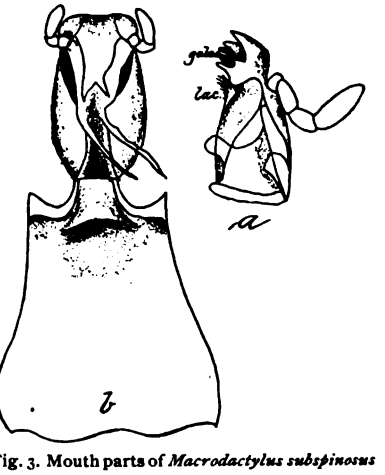

Fig. 3. Mouth parts of *Macrodactylus subspinosus*

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be again referred to later. The development in *Polistes*, where there is a bladder-like membranous expansion, covered with sensitive hairs (the hypopharynx?), is also to be noted, with the further note that it is not paired or jointed, but a mere membranous development or expansion, a true lapping organ.

The hypopharynx and epipharynx are fleshy, internal mouth structures, supposed to represent the tongue and palate of vertebrates.

Now let us see what developments must have taken place if the accepted explanation of the Dipterous mouth parts is correct. The labrum, from an external, head piece, shielding the mouth, becomes a true, functional, internal mouth organ; the mandibles become part of the maxillæ and migrate within the palpi; the galea disappears, and the whole maxilla becomes reduced to a single piece; the labium becomes most enormously developed, and adds two joints; the labial palpi disappear, the paraglossæ are wanting, and the ligula is not mentioned. But, on the other hand, besides the labrum, the epipharynx and hypopharynx become functional, chitinous, and, from a sensory or tactile development, become mechanical.

How this striking change in the functions and location of parts occurred, had never been explained, and that was my task. I assumed the correctness of the theory that insects, being developed from a common stock, would somewhere have a generalized type of mouth; or, at least, that there would be such variations of development, that the points at which the mandibulate and haustellate mouth branched, might be discovered. The natural point at which an explanation might be sought was not among the highly specialized forms such as *Musca*, but was rather among those forms in which division of the mouth parts reached the extreme, and thence the work would be in the direction of the specialized forms. A short study of the forms allied to *Bombus*, *Xylocopa* and *Apis*, among the Hymenoptera, showed that the tendency in the labium was nowhere toward a segmentation, but to an elongation; and my first object was to try and identify, among the Diptera, the true labium and the paraglossæ. Then those forms in which the proboscis was incompletely developed, were sought, and, finally, in a minute midge (*Simulium* sp.?), which swarmed at Anglesea, N. J., early this Spring, and almost drove me distracted by its painful bite, I found the solution!

Dr. Riley kindly sent me some specimens of the Buffalo gnat for study, and I had then the species which showed not only all the parts

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ordinarily recognized, but also the true labrum and mandibles. This is the only species I have seen in which the mandibles are present, and with this species I shall start, using at once the nomenclature which I consider correct, and which I hope to establish.*

In this species there projects from the middle of the front margin of the oral opening (clypeus?), a long, flat, chitinous process, reaching to the end of the mouth organs, supported each side by a rod reaching to within the clypeus, and, at the end of this central piece, resting

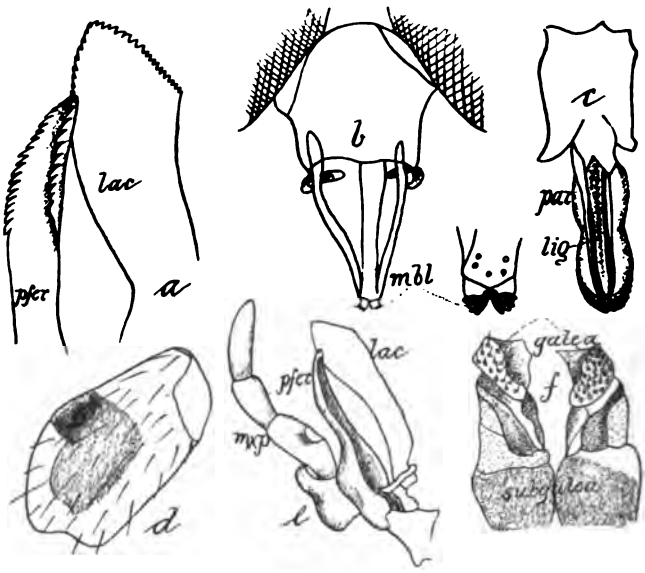

Fig. 4. Mouth parts of Buffalo gnat.

on a muscular base supported by the lateral rods, are the minute mandibles, set obliquely. They are red-brown, solid, three toothed, and grooved inwardly, in all respects like the mandibles of some Coleoptera and Neuroptera, and absolutely unmistakable. It requires a good objective on a well prepared specimen to see them at all, but a one-fifth brings them out fully and clearly. These mandibular supports are in front of the other mouth parts, and behind them, most prominently, are the parts which I consider the subgalea

* In the Report of the Entomologist 1886, Dr. Riley's account of the Buffalo gnat is illustrated (Pl. viii, fig. 2) by a figure of the head, which is very accurate, and in which the mandibles are properly shown. The meaning of the structure was not recognized by either author or artist.

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and galea, shown at *f*, fig. 4. These are here completely divided, the basal part of each broad, mostly chitinous, and forming more than half a cylinder. Above this are two segments, representing the joints of the galea, less chitinized, the basal segment largest, forming a shell, inside of which is the lacinia, but outside of which is the palpifer, bearing the maxillary palpi at its base. This latter piece, which may be stipes rather than palpifer, is also produced and forms a piercing organ. It passes outside of the galea until near the tip of the basal joint; here the cylinder formed by the segment is incomplete, and the palpifer enters to join the remainder of the piercing mouth parts. The lacinia is attached by a chitinous rod to this palpifer, and runs within the galea for its entire distance. At *e*, fig. 4, the lacinia, palpifer and maxillary palpus are shown separated from the rest of the mouth parts. At *a*, fig. 4, the tips of the lacinia and palpifer are shown, greatly enlarged, to bring out the serrated armature. The palpus contains on joint 2 a round pit connecting with a pocket of darker colored cells, as shown at *d*, fig. 4. Central to the mouth is the structure shown at *c*, fig. 4, composed of a broad basal plate, the mentum, bearing a stout chitinous process, showing evidently its paired character, especially at tip. These are the paraglossæ, and within the groove formed by these parts united at bottom, lies the ligula.

I omitted to state what fig. *f* distinctly shows, that the terminal joint of the galea consists of merely a shell, not more than half a cylinder, beset on the outer side with short hair, arising from fleshy tubercles. In this insect I found the Dipterous mouth parts most divided, and, so far as the galea is concerned in the condition most nearly approximating that of the mandibulate mouth. What I term the palpifer may be really the stipes, and the real palpifer may be the basal segment of the palpus itself; but, as will be seen in *Erax*, the palpi arise directly out of this part, and it is not a matter of very serious import, for my present purpose, to settle this question definitely. There is no outer covering of membrane to the mouth parts, and this is a point that requires notice, because of the important influence which that structure exercises upon the development of the palpi.

It may not be unnecessary to state that all the drawings made for this paper were sketched by the use of the camera lucida, and that the irregularities and lack of symmetry are faithful reproductions of what is seen in the slide itself. The image was thrown on a slightly

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inclined board, and there is a trifling distortion due to that cause; but which does not in the least interfere with accuracy of representation.

A close relative of the Buffalo gnat was found in a minute midge swarming at Anglesea, N. J., in May, and which showed a very distinct advance in mouth structure. The insect is about 1.5 mm. in length, and the head does not exceed .5 mm. in diameter. The task of separating out the mouth parts, small even in proportion to this head, was a difficult one, and a $\frac{1}{8}$ objective was necessary to make out all details. At *a*, fig. 5, the subgalea and galea are shown

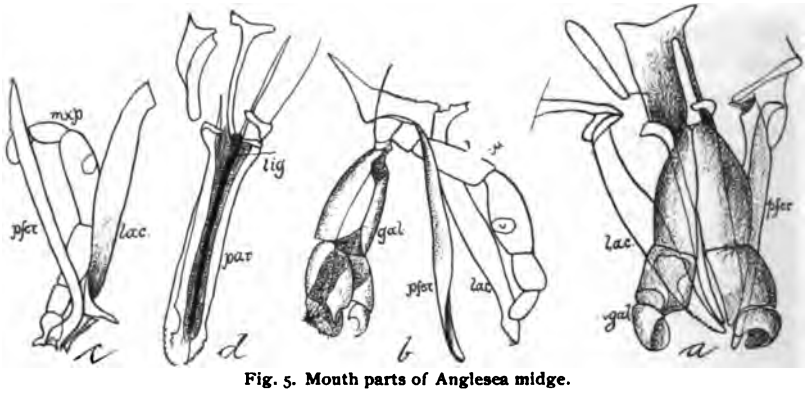

Fig. 5. Mouth parts of Anglesea midge.

from behind, the subgalea now united at base; but the joints of the galea are separate, and there is no trace of pseudo-trachea. In general structure there is no great departure from that of the Buffalo gnat, except that the subgalea unite at base, and are articulated to a stout chitinous piece, which may be the remnant of the cardo. There is a somewhat similar structure in the mosquito at the base of the "labium," and the line of development is directly from a form of this description to the mosquito, in which the labella also do not contain pseudo-trachea. In this figure we also note the method in which the lacinia and palpifer enter the galear cylinder, and the paired character of the structure is maintained. This is important, for the membranous expansion of the labium, seen in some Odonata and in *Polistes* (fig. 2), shows no trace of a paired structure. The tendency to a fragmentary condition of the joints is also worthy of attention, as here we notice the beginning of what will be afterward seen, as the chitinous supports of the labella in *Musca*. It is noticeable here, too, that the maxillary parts are not central, and arise outside the

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median or labial structures. At *b*, the galea and the lacinia, palpifer and palpus of one side are shown as they appear separated out, and at *c*, the remainder of the maxillary structure appears. It is interesting to note that the palpi are furnished with a sensory pit as in *Simulium*, of which, indeed, this is likely a member. Easily separable from the maxilla, without the destruction of any chitinous parts is the labium, shown at *d*. In this the ligula, while obvious in the preparation, is not separated out, because I could not manipulate my needles under the high power necessary. The paired nature of the paraglossæ is obvious, and this could not have anything to do with the labrum, from the simple fact that I do not know of a case in which the labrum is paired, and of no case in which it is an internal mouth organ. The labrum must also be articulated to the clypeus at base, if homologies are to be preserved, and this clypeus must then be the square plate seen in figure 4, *c*, and again in the figure of *Tabanus atratus*. This would bring the clypeus entirely inside of the head, where it does not belong, while if we take it to be the mentum, not only is its place natural, but the attachments to it have a natural significance, and the development is an easily explicable one; which is certainly not so if we refer to the labrum shown in figure 1, and are compelled to imagine this modified into a tubular or channelled prolongation. This interpretation also makes it unnecessary to account for the development of a fleshy, sensory organ, into a chitinous, mechanical structure.

Leaving the development of the galea for a moment, an examination of the mouth parts of *Tabanus* will be interesting. Fig. 6 represents the maxillæ and labium of the large black species which I take to be *atratus*. In examining the central organ here, we find the broad basal plate representing the mentum, the united paraglossæ, which here show no observable suture as in *Simulium*, the central ligula, and, most interesting of all, the rudimentary labial palpi, closely applied to the sides of the paraglossæ, but reaching some distance beyond them

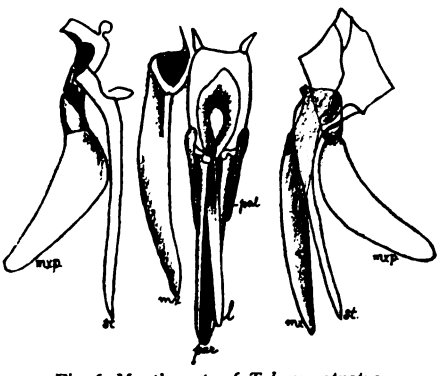

Fig. 6. Mouth parts of *Tabanus atratus*.

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along the mentum. The palpi are not at all functional, but are rigid, not articulated, yet not entirely connate with the *paraglossæ*. In *Tabanus lineola* (I feel safe in this determination) the palpi are still more distinct, but not yet free, nor have I found any species in which they are functional. I have a very strong conviction, however, that somewhere in the Diptera some vicious beast will be found in which the palpi are entirely free, and possibly functional. The figure of *Tabanus lineola* is here inserted to show the relative position of the parts, as attached to the head. No effort has been made to differentiate the galear structure, which is highly specialized here. Returning to the study of fig. 6, we find the right hand figure to represent the lacinia (*mx*), the palpifer (*st.*) and maxillary palpi (*mxp*), in their relative positions, attached together. The lacinia alone (*mx*) is shown to the left of the labium, and at the extreme left are the palpus (*mxp*) and palpifer (*st*). This figure shows the development of an important tendency in the palpi. It will be noted that, at the base, there is but a flat strip connecting with the base of the palpifer, and that the joint becomes a complete cylinder only near its tip. The chitinous band forms the real base of the palpus, but the membranous extension from the margin of the head envelopes the base of the mouth, and the palpal joint first becomes complete on the outer side of this membrane. That is to say, outside of the enveloping membrane, the palpus is complete, but within the head the joint becomes partly muscular, and the chitinous cylinder is incomplete. This is important, for it is the beginning of the complete separation of the palpi from the functional mouth parts.

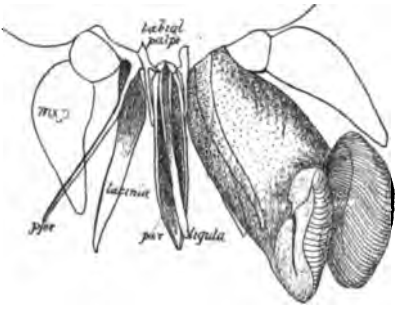

Fig. 7. Mouth parts of *Tabanus lineola*.

The next step will be noted in the Asilidæ, of which *Erax* sp. and *Asilus sericeus* will be figured.

In *Erax*, we have at figure 8, *c*, the appearance of the mouth parts from the front, showing the attachment of the palpi (the dotted portions representing membrane) and the method in which the palpifer enters the galear structures. The terminal joints of the galea are completely separated, but the basal joints are united beneath. The

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structure of the sensitive portions of the terminal joint is shown at *a*, and consists of a series of fleshy tubercles on a membranous base, the tubercles all furnished with rather stiff hair.

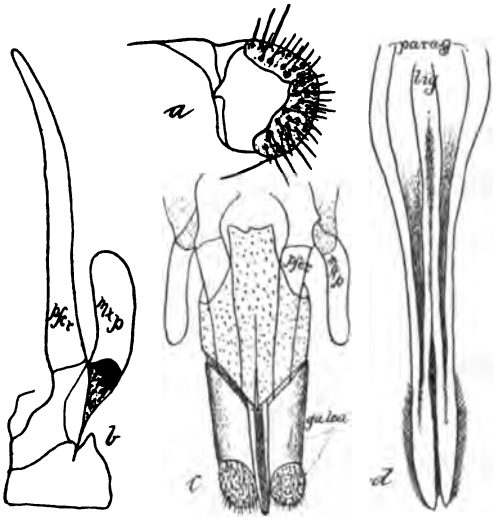

Fig. 8. Mouth parts of *Erax* sp.

At *b*, is shown the structure of the palpifer and palpus, the latter single jointed and showing the same tendency noted in *Tabanus*. At *d*, is shown the labium, the ligula central, not easily separable from the paraglossæ, which very evidently show their paired character in this species.

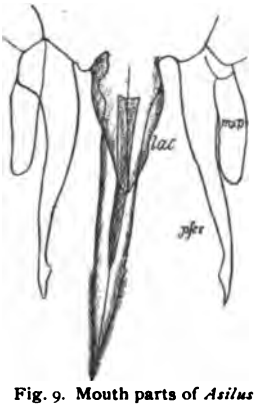

Fig. 9. Mouth parts of *Asilus sericeus*.

In *Asilus sericeus*, fig. 9, the galear development is cut away, and we note the relative position of the parts. We notice here, too, what is of some importance, that the lacinia are reduced in size and really rudimentary, thus forming the intermediate step to *Stomoxys* and *Hæmatobia*, where it is entirely wanting. So, also, the galear structure reminds one strongly of *Stomoxys*, especially in the structure of the tip.

Of other piercing species I will call attention only to the mosquito. This unfortunate insect has been the subject of so many figures that I will

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add none of my own, save that of the tip of the galea. This differs somewhat from Dr. Dimmock's figures of the same structure; but the species are different, and I have found that no two of the five species examined agree, nor do any agree with Dr. Dimmock's species. It is readily seen that while we have here in essentials the chitinous structure of *simulium*, yet we get a tendency in the terminal joint to form a mere chitinous cap, a breaking up of the chitine into fragments and a filmy covering over the inner face—the rudimentary labella.

Fig. 10. Galea of mosquito.

At this point we drop the piercing flies, and now we find in point of development a steady loss in the piercing organs, and as regular a gain in the galea. It is worth noting, too, that while the fulcrum in the piercers is not developed where the mouth parts are much divided, it becomes prominent as the maxillary development becomes weak. In *Culex* there is a very pretty little fulcrum, much like that of the *Leptid*, hereinafter figured. In *Stomoxys* there is a very decided development. It is a suggestive fact that when the mentum disappears. the development of the fulcrum begins.

Bombylius sp., in which the mouth parts are elongated, forms a good subject for the next figure.

This is one of the species in which the proboscis is carried straight forward, and the flexion is so strong that it is not easily overcome. The fulcrum of the figure is therefore seen flexed upon the labium, to which it is articulated at its base. The ligula is quite closely united with the paraglossæ, and is so shown in the figure. The lacinia are flattened strips arising at the sides of the labium and partly enveloping it. The palpifer is a fine seta, shorter than the lacinia or labium, and with a basal extension above the insertion of palpi. This is an interesting fact, as a beginning in the peculiar change undergone by this part.

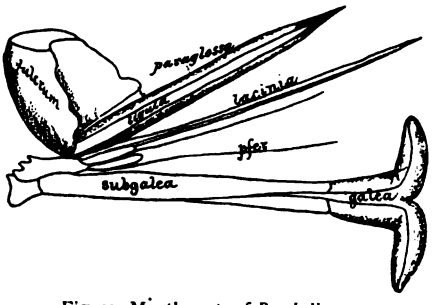

Fig. 11. Mouth parts of *Bombylius* sp.

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The galea is distinctly divided at the tip, forming evident lobes, covered with a delicate membrane, which is wrinkled, but is not furnished with pseudo-trachea.

Because nearly allied to *Bombylius* we may now examine *Anthrax*, although not nearest in any direct line of development save for the palpifer. As in *Bombylius*, the proboscis is so fixedly projected forward, that it is difficult to straighten, and the mouth parts are therefore figured lying against the fulcrum. Here, too, a study of the method of union of labium to fulcrum, points to the mentum or submentum, as concerned in the development of that organ. The lacinia have become broad, roughly shaped like a spear-head; they envelope the labium, and, with it, lie in the galea. The subgalea is distinctly paired, each side piece divided longitudinally, so that here we see the beginning of the central supporting rods, well developed in *Eristalis*, and also the foundation of the structure forming the broad back plate of the operculum or medi-proboscis. The labellate development of the galea is well marked, though the lobes are not well divided. The chitinous parts of the two joints are reduced to two pairs of small plates, which alone indicate the original nature of the structure. The most interesting character is in the palpifer. Heretofore we have seen the palpus attached at or near base, and always in forms in which the proboscis is not flexed. In *Bombylius* we saw the first approach to a basal prolongation, which in *Anthrax* is much more marked. The palpus is small and feeble; the basal prolongation of the palpifer is not long, but it is broad, flattened, roughened as for muscular attachment, and very thoroughly chitinized. The apical process is very decidedly less chitinized, and does not extend to the tip of the labium. As is usual, its point of insertion is outside of the galea, which it enters with its apical process, very close to base.

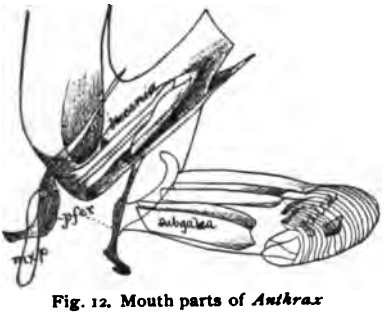

Fig. 12. Mouth parts of *Anthrax*

Beginning a new series, not so closely connected with those forms in which the mouth parts are adapted for piercing, are a number of species in which the galea is well developed into the labellate form still, however, retaining the marks of its origin in a remarkably perfect condition, and having the proboscis not hinged.

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First among these is a small *Stratiomyid*, of which, unfortunately, my material was too scant to make out all the parts as thoroughly as I desired. It is a small species, caught on the windows of my laboratory, and the figures are from one of the two specimens taken, the other being spoilt in dissecting. The galear structure shows excellently well. The subgalea is evidently divided, surmounted by the two galear joints, each of which is distinct, outwardly chitinous, inwardly with a delicate membrane, in which the pseudo-trachea are well developed. In the specimen, more obviously than in the figure, the character of the central chitinous supporting rods as fragments of the galea joints, is evident, and we have here, practically, the structure of the Simuliid galea, the inner face completed by a membranous expansion and tracheate.

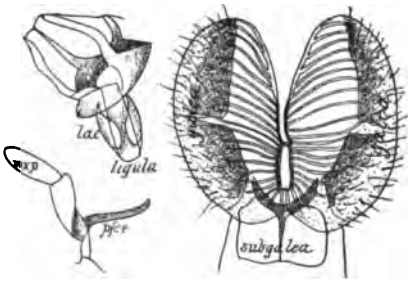

Fig. 13. Mouth parts of Stratiomyid.

The palpifer is here reduced to a mere rudiment, without any basal process, and in natural position reaching barely to the center of the galear envelope. The labial structure is peculiar, and I regret that I had no specimens for further study. There is a fulcrum very like that found in the mosquito, and entering that centrally is the flattened, slightly concave labium or ligula, in which I could not trace any division of parts. The lacinia is a mere enveloping lappet, whose point of attachment is not satisfactorily made out. Altogether, the form is a valuable one, and the Stratiomyidæ may present characters of great interest where abundant material for dissection is at hand.

Fig. 14. Mouth parts of Leptid.

A very distinct advance is seen in the Leptidæ, species undetermined. The subgalea is united, and, while the chitinous parts of the galea joints are well distinguished, the enveloping membrane covers the whole

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inner side, and the pseudo-trachea are confined to the apical expansion. The chitinous fragments have been carried upward, and on them the tracheate system rests. The structure of the palpi does not differ very essentially from *Stratiomyia*, as can be seen by a comparison of figures. Here, however, there is developed a sensory pit in the palpus, and the palpifer is still further reduced. Perhaps it may be in order to state that the apparent segmentation of the galea, on the right of the figure, is really a fracture, and that the left side illustrates the perfect condition. The labium is shown at *a*. There is a broad, large, basal mentum, reminding of the Tabanidæ, to which the ligula and paraglossæ, closely united, are attached. The lacinia, not articulated to the mentum, but almost completely enveloping the labium, is shown slightly separated from it.

This is also one of the species in which the proboscis is not hinged. The fulcrum does not show in my specimens, and I made no effort to seek it, as I was not studying its development. The presence of the distinct mentum would, however, indicate the absence of this organ.

Next comes *Tipula* sp., a form in which the maxillary palpi are well developed. No effort was made to study any but the galear structure, though several species were examined, as nothing of special interest was obvious. The galea is here, in some respects, most perfect. The chitinous parts are flattened, and, with the exception of the terminal cap, are entirely within the membraneous envelope. The character of the structure is best seen at *b*, figure 15, where the chitinous structure is separated off and figured. The two sides here are entirely separated, the joints are well marked, and a study of this species alone leaves an overpowering conviction of the true homology of the parts, which could not possibly be reconciled by any theory of labial development. Within the sac enclosing this galea, is a series of large tracheæ, uniting to a few trunks running into the head. There seem to be no true pseudo-trachea, but there is a series of transverse wrinkles covering the inner face. No dissections were made to get at the other structures, since the galea was all I was seeking for here.

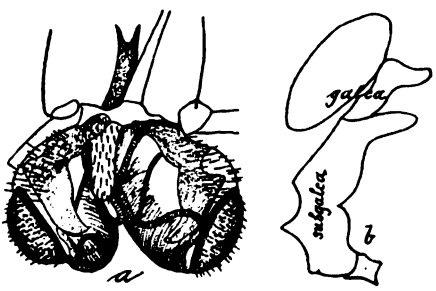

Fig. 15. Mouth parts of Tipulid.

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Some specimens of a Dolichopodid, prepared for examination, proved failures, owing to a lack of differentiation in the mounted material, and only a very unique character on the galear envelope was noted.

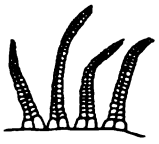

Fig. 15. Pseudo-trachea (?) of Dolichopodid.

Instead of the pseudo-trachea, or the wrinkled structure often representing it, we find here a series of geminate tubercles, decreasing in size from the margin, and ending in the membrane. I have not seen this appearance in any other species, and could not study more than the one species of the family from lack of material.

As suggested above, in all of the forms last treated, the proboscis is not hinged or folded, and in none do we find any trace of a basal prolongation of the palpifer; that organ itself becoming very much reduced. In all the following species the proboscis is hinged and the galea development is of the same type. This type is best illustrated by a diagrammatic view of the structure in *Eristalis transversus*, in which the chitinous remnants of the galea are so arranged that their character is obvious. The subgalea is united, but the suture is evident, and the lobes, almost entirely separated, easily show their jointed nature. With this diagram for reference, the figure of *Eristalis tenax* may be presented. In it will be necessary to premise, that the membrane enveloping the mouth is extremely extensile, and that, in nature, the tip of the labium extends to the tip of the subgalea or very near to it. This latter part is a single plate, but the suture is evident, and it is plainly composed of two similar pieces. The labium is completely enveloped by the lacinia, which do not, however, extend to the base. The ligula is well distinguished, and,

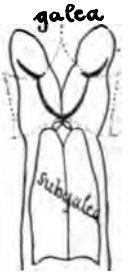

Fig. 17. *Eristalis transversus.*

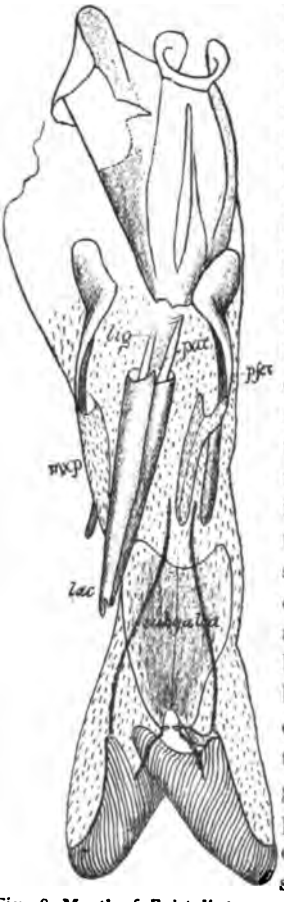

Fig. 18. Mouth of *Eristalis tenax.*

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as usual, the articulation is very closely to the fulcrum. Laterally we see the palpifer, now completely without chitinous connection with the rest of the maxilla, stoutly produced toward the base and with but a small apical process. The palpi themselves are almost completely separated from the palpifer, except by muscular attachments, and the blunt character of the apical process itself, indicate its disuse as a piercing organ, almost as well as the fact that it is not equal in length to either the labium or lacinia, and so does not reach to the tip of the central aggregation of mouth parts. In fact here, more than in any other species heretofore figured, the palpifer is disconnected from the other mouth organs, and first changes its function from that of a piercing organ to one offering assistance in flexing and extending the proboscis as a whole.

The peculiar extensibility of the membrane enveloping the mouth parts is not confined to the species figured, but is notable in all of the five species of Syrphidæ examined. . It requires no force to extend it, and is not elasticity; but neither is the extension spontaneous in macerating or preservative media. In placing the prepared specimen on a slide, in position preparatory to mounting, the extension is readily made with a blunt needle, and its limit is easily known. Whether the insect itself has the power of making the extension voluntarily I do not know, and observation on living specimens would be required; it is, however, reasonable to assume that the power exists.

Eristalis is interesting in another respect, for, in the three species examined, the labrum, in its proper position, and normal in shape, marking the frontal margin of the oral opening, is easily distinguished; its claim to form a part of the internal mouth is thus absolutely negatived, for every organ represented in the mosquito is also represented in *Eristalis*, and as the labrum exists independently of all, it is of course an absolute impossibility that it can find a homologue in any of these parts.

Another of the Syrphidæ, *Sphærophoria cylindrica*, may be usefully presented here, as an advance in the basal development of the palpifer. Only the necessary parts are figured, as the structure does not in other respects differ from that of *Eristalis* in any important features. The palpifer to the right of the figure is shown complete, and without the palpus. The apical development is seen to be small, merely rudimentary in fact, while the basal prolongation is very decided, with broad, flat surfaces for muscular attachment. The

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palpus, seen at the left of the figure in its relation to the palpifer, is completely separated by muscular attachments, while retaining a close proximity to it, so that the relationship is easily manifested.

In a common muscid species, perhaps a *Lucilia*, with bright, shiny, yellowish to green bronze thorax, we note a still further separation of palpus from the palpifer, and a more complete specialization of the latter organ. The palpus now retains no apparent relation to the chitinous parts of the mouth, the base arising from a more chitinized strip of the enveloping membrane. Of the piercing character of the palpifer so little trace remains, that its true character could not be suspected without a study of the species previously figured. In fact, there is now a complete change of function, for I attribute to this part a prominent share in the flexion of the proboscis. The part is not seen in any species examined by me, in which the mouth parts are rigid, like *Tabanus*, *Simulium*, *Erax* or *Culex*, though in the latter there may be a small basal prolongation similar to that of *Bombylius*. Here, the flexion is a very limited one, however, unaccompanied by any retraction. In forms like *Leptis* and *Stratiomyia*, where there is mere retraction without flexion, there is no basal prolongation whatever, and, as no piercing effects are required, there is a simple reduction in size, without any change of function. In the development of what may be termed the muscid type, in which the mouth parts become entirely enveloped in a membraneous extension of the oral opening, and the sac thus formed becomes entirely retractible within the head, a new adaptation becomes necessary. The character of the mouth has changed; piercing organs are no longer required; the palpifer, from its situation as the exterior part of the maxillate structure, gives the greatest opportunity for leverage and the modification begins in the direction of a process for attaching the muscles. It is notable that, in the beginning, the basal process is short, broad and flattened, strongly roughened for the muscular attachments; a mere appendix to the functionless, but still well developed piercing organ. As the development progresses the piercing organ becomes smaller, until it is

Fig. 19. Operculum and palpifer of *Sphærophoria cylindrica*.

Fig. 20. Fulcrum and palpifer of *Lucilia* sp.

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rudimentary; the basal extension enlarges, or rather elongates, and, as it becomes longer, and the leverage becomes greater, it decreases in bulk, and becomes finally a chitinous rod. At first free, it gradually attaches itself by what must now be considered its apex, but was originally the base, to the base of the lacinia, and, as these disappear (*Stomoxys*) to the labial organ, so that it seems a mere appendage to this part, and remains attached to it on separating the structures.

In a careful preparation of the blow-fly, *Calliphora vomitoria*, intended to bring out the relative situation of the parts viewed laterally, I was able to show, more clearly than I ever could in a flat preparation, the precise location of the separate structures. It will be seen that centrally we have the labium, with its united paraglossæ, and very distinct, central ligula, attached by a muscular hinge to the base of the fulcrum. In front of this labium, and partly enveloping it, are the lacinia, closely united, and forming the chitinous front margin of the operculum or medi-proboscis. Attached at the base of this lacinia is the palpifer, extending free along the sides of fulcrum, and by its muscular attachments elevating the proboscis, so that it rests with the lacinia between the palpi and against the membrane opposite the open front of the fulcrum. In connection with this flexed condition it will be of interest to again refer to the figure (3 *b*) of *Macrodactylus*, as suggestive of a possible line of development for the fulcrum.

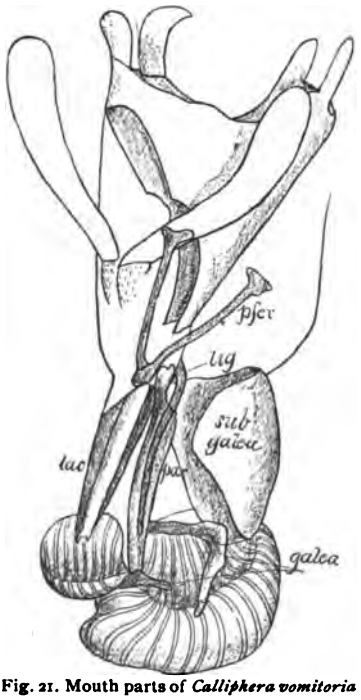

Fig. 21. Mouth parts of *Calliphera vomitoria*

The palpi in the blow-fly are from the enveloping membrane, supported by a narrow chitinous strip, indicated in the figure by the dotted portion at base. The subgalea forms the posterior or chitinous portion of the operculum, and I can see no divisional suture. Attached are the galea, reduced to the well known chitinous supports of the labellate development.

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Finally, I will add a figure of *Musca domestica*, the common house-fly, in which the parts are named in accordance with what I believe to be their true character. The figure is correct, save in the pseudo-tracheal system of the galea in which no attempt at accuracy was made.

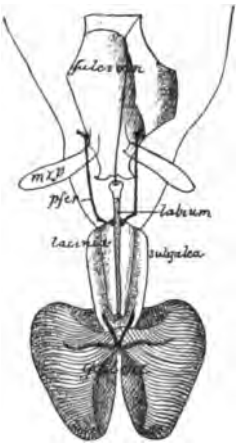

Fig. 22. Mouth parts of *Musca domestica*.

I have now covered a series, showing, as I believe, the homology between the mouth parts of the Diptera, and the typically mandibulate mouth. Many more specimens were examined than are here referred to, only those useful to my purpose being selected to figure, and only such characters being selected for study as bore upon the present inquiry. I have shown the presence of the true mandibles in *Simulium*, and their absence elsewhere. I have traced the "mandibles" of previous authors—from a stout, piercing organ, to the "great tendon"—and have shown it to be a palpifer first, and an attachment for muscles flexing the proboscis finally. As a mere palpifer it may yet, in its development, represent as well the stipes, which I do not otherwise identify. I have proved the "labium" a mandibulate organ, and a modification of the galea. I have shown its original paired character, and its development to the typical muscid proboscis. I have proved its jointed nature, and have identified the chitinous supports of the pseudo-trachea, as the remnants of the original segments. The lacinia have always been recognized as the "maxillæ," and I have shown to what particular piece they are homologous. I have shown the mentum and the rudimentary labial palpi, and have homologized the labrum-epipharynx and hypopharynx with the ligula and paraglossæ.

In my studies I have followed a different line from that adopted by Dimmock, Macloskie, or Kraepelin. I made no sections of any kind, but studied each organ in its entirety, in its relation to others, and in its development. In other words, my studies were morphological rather than anatomical.

On mere philosophical and physiological grounds, I claim my interpretation of the parts as the true one. It is perfectly conformable to any natural theory of evolutionary development; it accounts

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for every organ of the mandibulate mouth; it requires no change of function for any organ; the galea as a "scraping and tearing" organ being maxillary in its character, not labial; the development required is simply a further development of the line started in the Hymenoptera, of which Cresson says: "mouth mandibulate, and with a lower lip or tongue,* *sheathed by the maxillæ;*" it requires no further segmentation of any structure; it does not require the total loss of any part at *all* points of the series, nor does it anywhere require any unusual development or change from a sensory to a functional organ; finally, it does not require any change in relative position of the parts.

I have not the least doubt that the series presented by me could be rendered much more conclusive; but I am hampered by a lack of material, only the few species which I collected as I ran across them during the past season being at hand to draw from.

If my explanations are correct, some changes must be made in the nomenclature of the mouth parts in the Hemiptera as well.

SOME NOTES ON ARÆOSCHIZUS.

BY GEO. H. HORN, M.D.

Since my Revision of the family Tenebrionidæ in 1870, very little has been done beyond the description of new genera and species which have been discovered. All the species of the genus now under consideration have been rare in collections with the exception of *sulcicollis*, which was found by me in considerable number, and distributed liberally, thereby making the genus known in collections. In the meantime other collectors have, from time to time, found small numbers of one or other species, so that at the present time quite good series of all the species have accumulated in my boxes.

The species are all quite small, somewhat ant-like in form, but more depressed, and very sluggish in their movements. Their color is some shade of brown, the surface without lustre. The elytra are elongate-oval, the humeri rounded, the curve descending from the peduncle of the body. The surface of the elytra is costate, there being four elevated costæ on each side, excluding the sutural, of which the first and third are nearly entire, the others shorter. Between these costæ are two rows of coarse and deep punctures, never

* The italics are mine. The enveloping "maxillæ" are the galea.

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so closely placed as to be crowded, but so large that those of one row alternate with the other, the surface between the rows is smooth and glabrous. The summits of the costæ have a single row of scale-like hairs, yellowish in color, usually flatly recumbent, sometimes quite erect.

In about an equal number of species (rarer and but little known in collections) the costæ are less elevated, the punctures of the rows smaller and separated by a finer costa, which bears at its summit a row of scale-like hairs similar to that of the principal costa. This sculpture give the appearance of seven finely elevated costæ in place of four.

One species has the anterior and middle femora toothed at middle, in all the others the femora are simple.

The head varies in form in all the species, the most broadly in *regularis*, narrowest in *sulcicollis*, and most abruptly constricted in *armatus*.

Based on the above observations the following table is presented as a more satisfactory arrangement of the species.

Elytra with four discal costæ, the interspaces coarsely biseriately punctate.....2.
Elytra with seven less elevated costæ, the interspaces with a single row of punctures.....3.

2.—Scales at summit of costæ and at margin of thorax short, inconspicuous, recumbent.

Thorax sulcate or longitudinally impressed at middle.

Head, regularly oval, but little longer than wide, sides arcuate, hind angles broadly rounded.....**regularis.**

Head elongate-oval, longer than wide, sides nearly straight, oblique and convergent, at base rather abruptly narrowed to the neck. **sulcicollis.**

Thorax convex, at most slight impression at middle of base; head oblong oval, sides arcuate and near the base arcuately narrowing to the neck.....**simplex.**

Scales at summit of costæ and margin of thorax long, on the costæ erect.

Thorax with very well marked median sulcus, limited each side by a row of erect scales; head oval, but little longer than wide, sides arcuate, rather abruptly narrowed to a neck at base.....**fimbriatus.**

3.—Femora unarmed.

Thorax narrow, evidently longer than wide, and slightly narrower than the head, the disc not sulcate; head oval, sides arcuately narrowing from the base of the antennæ; humeri of elytra very obliquely rounded, the hairs at the summits of the costæ short, bristle-like and nearly erect.....**costipennis.**

Thorax very little longer than wide, as wide as the head, the disc vaguely sulcate; head rather broadly oval, sides regularly arcuate and broadly rounded at the hind angles; elytral humeri rounded, not oblique, the costæ with short scale-like, recumbent hairs. **decipiens.**

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Anterior and middle femora armed in front of middle with a small tooth.
Thorax as wide as long, vaguely sulcate at middle; head longer than wide, sides nearly straight, slightly convergent posteriorly and at base very abruptly narrowed to a neck; elytral humeri obtusely rounded, the costæ with short, recumbent, scale-like hairs.....**armatus.**

The characters given in the table are so full as to make any detailed descriptions of the species almost unnecessary, therefore only such remarks will be made as seem useful to supplement those already given.

A. regularis Horn, Trans. Amer. Philos. Soc. xiv, 1870, p. 274.

The thorax is longer than wide, sides arcuate in front, then obliquely convergent to base with a slight sinuation, the median sulcus rather feeble. The hairs at the summits of the costæ are short, semi-erect and inconspicuous. The propleuræ are coarsely, not closely punctate. Length 4.5–5 mm.; .18–.20 inch.

Collected by me originally at Fort Grant, and more recently by H. F. Wickham, at Tucson, about sixty miles further south, in Arizona.

A. sulcicollis Horn, Trans. Amer. Philos. Soc. xiv, 1870, p. 274.

The thorax is decidedly longer than wide, strongly arcuate in front, obliquely narrowed with a distinct sinuation toward the base, the median sulcus very well marked. The elytral humeri are somewhat obliquely rounded, the hairs at the summits of the costæ short, inconspicuous and scale-like. Propleuræ sparsely coarsely punctate. Length 4 mm.; .16 inch.

Occurs in Owen's Valley, California. I have not seen any other specimens than those collected by myself in that region.

A. simplex Cas.*—Brownish, head, thorax and legs sparsely clothed with yellowish, recumbent, scale-like hairs; head oval, longer than wide, widest between the antennæ, thence gradually arcuately narrowed to the neck; thorax longer than wide, slightly narrower than the head, sides arcuate in anterior third, then obliquely narrowed with a feeble sinuation to base, disc convex with a depression at middle of base; elytra elongate-oval, equally narrowed at apex and base, the humeri obliquely rounded, disc quadricostate, the intervals coarsely, biseriately punctate, the costæ with recumbent scales at summit; propleuræ sparsely punctate. Length 3—4 mm.; .12—.16 inch.

This species might readily be mistaken for *costipennis*, but the intervals have not the elevated line between the costæ as in that spe-

* Just as the proof sheets of these pages came to hand a pamphlet extract from the Annals of the N. Y. Acad. Sc. vol. v, was received from Capt. Casey, in which the two species were found described on p. 369. I have therefore changed the names given and allowed the descriptions to remain.

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cies. Exterior to the outer costa there are three series of punctures, two coarser which belong to the interval proper and a finer row on the epipleuron.

Occurs in southwestern Texas, locality unknown.

A. fimbriatus Cas.*—Brown, elytra paler; antennæ apparently stouter than normal, clothed with rather long, scale-like hairs; head oval, longer than wide, sides arcuately narrowing from the base of the antennæ, rather abruptly constricted at the neck, sparsely clothed with yellowish scales; thorax but little longer than wide, sides arcuate, near the base sinuate, disc sulcate at middle, the groove limited each side by a row of erect scale-like hairs, margin of thorax similarly fimbriate; elytra elongate-oval, equally narrowed at apex and base, humeri obliquely rounded, disc quadricostate, the costæ at summit with erect, scale-like hairs, curved at tip, intervals coarsely biseriately punctate; propleuræ rugulose, coarsely and closely punctate; legs sparsely scaly, femora mutic. Length 4 mm.; .16 inch.

This species resembles *sulcicollis*, but the thoracic groove is much better marked and limited. The sides of the head are arcuate and not straight and oblique. The scale-like hairs are here much more conspicuous than in any other species known to me, especially as the margin of the thorax, the summits of the costæ and on the antennæ.

Collected by Mr. H. F. Wickham, near Tucson, Arizona.

A. costipennis Lec., Amer. Lyc. v, p. 138.

In this species the sides of the thorax are very feebly arcuate, obliquely narrowed from the anterior third to base, the disc convex, with a slight impression at middle of the base. The elytra are narrowly oval, equally narrow at either extremity, the humeri very obliquely rounded, the disc has the usual four costæ, the double row of punctures between them, these separated by a less elevated ridge, the costæ and ridges at their summits have short, erect, bristle-like hairs not closely placed. Propleuræ rather sparsely punctate and shining. Length 3–4 mm.; .12–.16 inch.

The resemblance between this species and *simplex* have already been alluded to.

Occurs at Vallecito, Cal. (LeConte), Fort Grant, Tucson, Ariz. (Wickham), and Fort Cummings, N. Mex. The last named specimen has the hairs of the costæ more scale-like and less erect, and may be a distinct species.

A. decipiens n. sp.—Brown, opaque; head, thorax and legs sparsely clothed with short yellowish scales; head broadly oval, scarcely longer than wide, sides arcuate, the hind angles broadly rounded; thorax a little longer than

* See foot-note on page 341.

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wide, sides arcuate in front, thence oblique and straight to base, disc convex, a slight impression at middle of base; elytra oblong oval, humeri obtusely rounded, the disc with seven nearly equally elevated costæ, the intervals with a single series of coarse punctures, the summits of the costæ with small, recumbent scales; propleuræ coarsely, sparsely punctate, somewhat rugose in front. Length 4 mm.; .16 inch.

This species has a deceptive resemblance to *regularis* in form and color, but differs in the absence of the thoracic groove and the greater number of elytral ridges. In this species and the next there is but little difference between the costæ in their elevation.

Collected in southern Arizona by Morrison.

A. armatus Horn, Trans. Amer. Philos. Soc. xiv, 1870, p. 275.

The head is longer than wide, the sides straight and narrowed from the base of the antennæ, at base abruptly narrowed to the neck. Thorax about as wide as long, sides arcuate in front, then obliquely narrowed to base, disc convex, with a vague median sulcus. Elytra oblong oval, humeri broadly rounded, disc with seven elevated lines, the intervals with a single series of coarse punctures, the summits of the ridges with short, semi-erect, scale-like hairs. Propleuræ coarsely, rather closely punctate and rugose. Anterior and middle femora toothed in front of middle. Length 3.5–4 mm.; .14–.16 inch.

Resembles the preceding in appearance, but easily known from all the other species by the dentate femora.

One specimen, Owen's Valley, Cal., Green River, Wyo., Wickham. Mr. Wickham observed these associated with ants in the same manner that I had noticed *sulcicollis;* this is, however, merely an accident of habitat, as Aræoschizus is neither parasitic nor inquiline.

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ADDITIONS TO LIBRARY.

JANUARY 23, 1890.

Entomologist's Monthly Magazine, vol. xxv, December, 1889. From the Conductors.

CORRIGENDA.

Page 269 last word **dissimilis**, should be at end of first line on page 270.
Page 270, in description of dissimilis, read 9-jointed.
Page 277 insert in HYDROBIUS—H. tumidus Lec. Synopsis p. 372; Horn, Revis. p. 134.
Page 290, the line in table beginning with 3, should have 4 at right end.

[illegible]

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Bihang Kongl Sœnska vetenokaps—Akademiens Tolfte bandet und trettonde bandet afdelning 4. From the Academy.

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Aurivellius H. Bd. xxi, 15, 1885, 33; 1887, 27. From the Author.

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Flowers and Insects, Nos. 1 and 2, Robertson. From the Author.

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Grain Plant-louse in Ohio, Circular No. 2. From the Author.

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Annotated Catalogue of the insects collected in 1887–88, Howard. From the Author.

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New North American Acridæ, Bruner. From the Author.

Horn Fly, Riley and Howard. From the Authors.

Compte-Rendu, December, 1889; January, 1890. From the Society.

Die Tagfalter Europas und des Caucasus, Bramson. From the Author.

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A reply to C. V. Riley, by G. H. Horn, M.D. From the Author.

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Faune de L'allier, par Ernest Olivier. From the Author.

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Bolletino del Naturalista, vol. x, No. 1. From the Editor.

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Natural Enemies of the Fluted Scale, by A. Koeble. From the Author.

Proceedings of the California Academy of Sciences, second series, vol. ii, 1889. From the Academy.

Psyche, vol. v, Nos. 167 and 168. From the Editor.

Journal of the Royal Society of New South Wales, vol. xxiii, pt. 1. From the Society.

Bulletin of the Ohio Agricultural Experiment Station, eighth report. From the Station.

Animals of the Waters of the Mississippi Bottoms, by G. H. Garman. From the Author.

The Kansas City Naturalist. From the Editor.

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Coleoptera Nova Argentina, Carlo Berg. From the Author.

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Revised Check-List of the North American Noctuidæ, by A. R. Grote. From the Author.

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The Fossil Butterflies of the Florissant, Scudder. From the Department of the Interior.

A Tube-building Spider, by W. L. Poteat. From the Author.

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Biologia Centrali-Americana. Diptera, pp. 41–56. Index to vol. ii, pt. 2. Coleoptera, vol. iv, pt. 2, pp. 121–160; vol. i, pp. 345–368. Arachnida, pp. 57–64. Coleoptera, vol. ii, pt. 1, pp. 169–176. Heterocera, vol. i, pp. 369–384. Diptera, vol. ii, pp. 57–88. By purchase.

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Fifteenth Report of the State Entomologist of Illinois, by S. A. Forbes. From the Author.

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Bulletin No. 61 Michigan Agricultural Experiment Station, also Nos. 58 and 62. From the Station.

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Journal Elisha Mitchell Scientific Society of Washington, vol. vi, part 2. From the Society.

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Bulletin No. 10 University of Minnesota Agricultural Experiment Station. From the Station.

Notes on the Comparative Vitality of Insects in Cold Water, Schwarz. From the Author.

Myrmecophilous Coleoptera found in temperate North America, Schwarz. From the Author.

Psyche, vol. v, No. 169. From the Editor.

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Schach dem Darwinismus, Johannes Schilde. From the Author.

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The Mouth-parts of the Thysanoptera, by H. Garman. From the Author.

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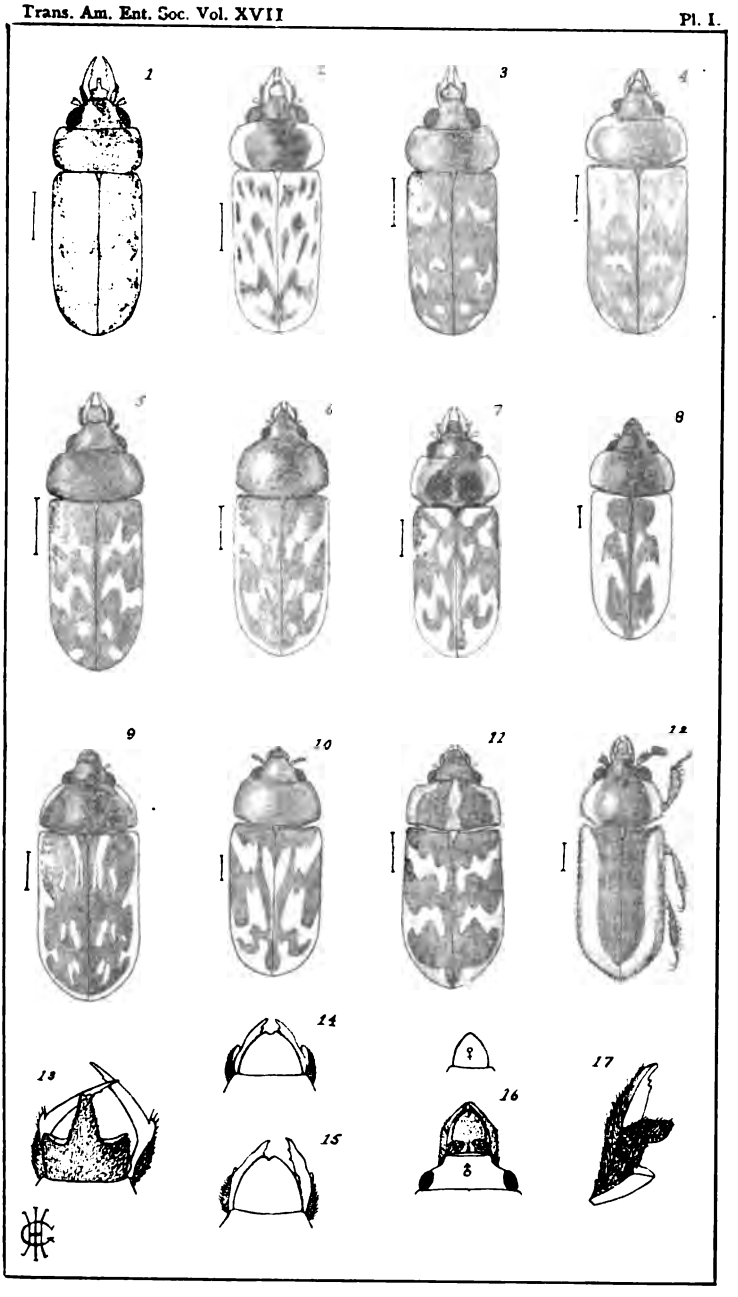

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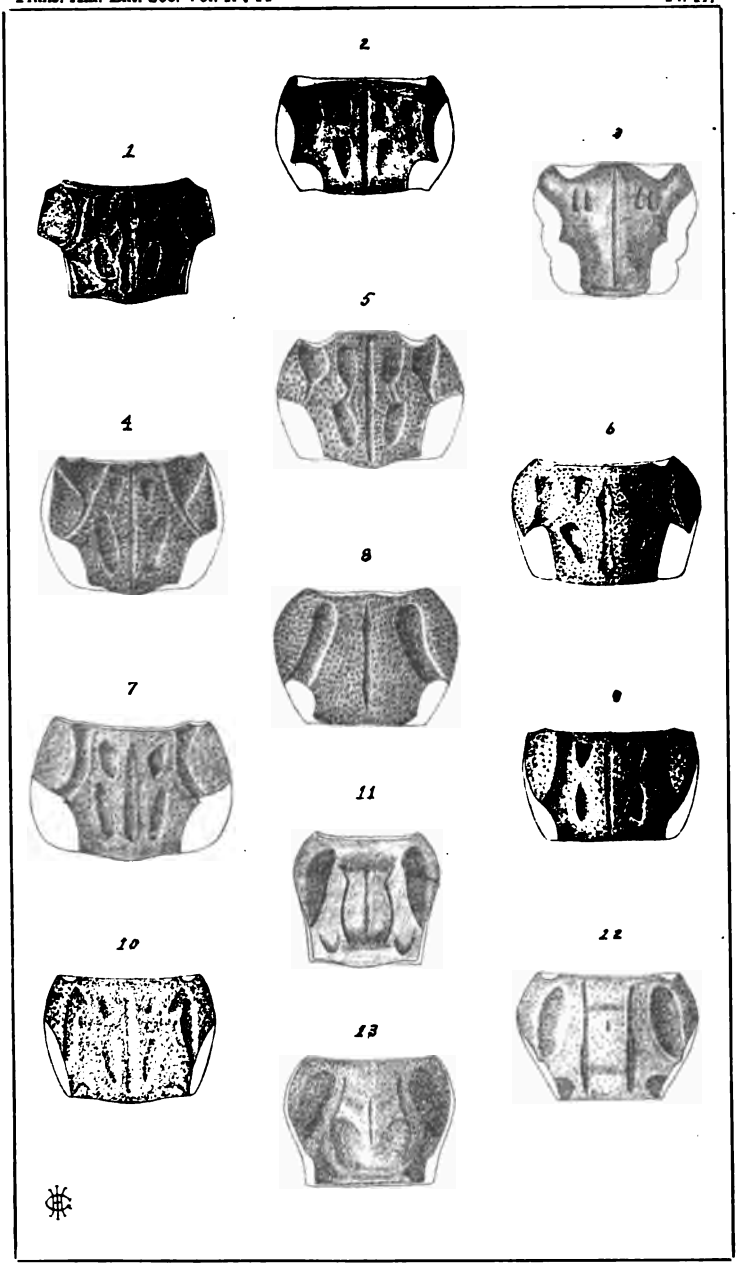

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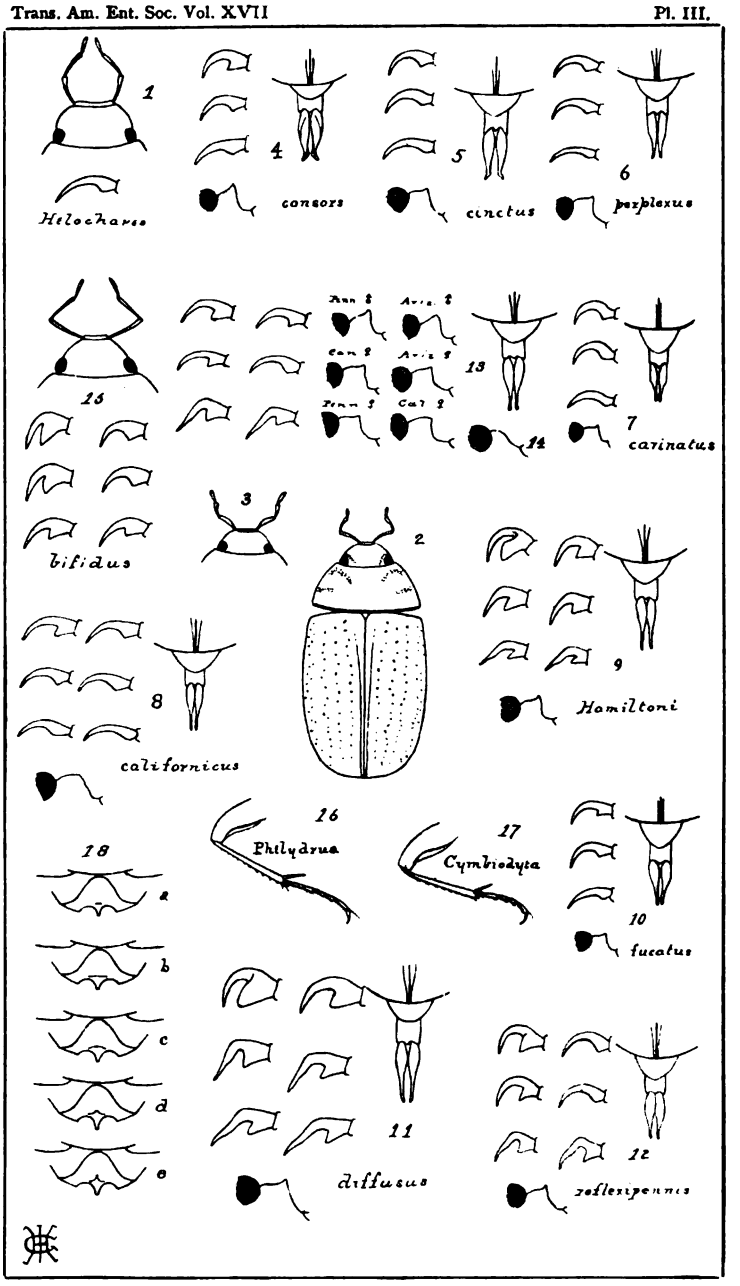

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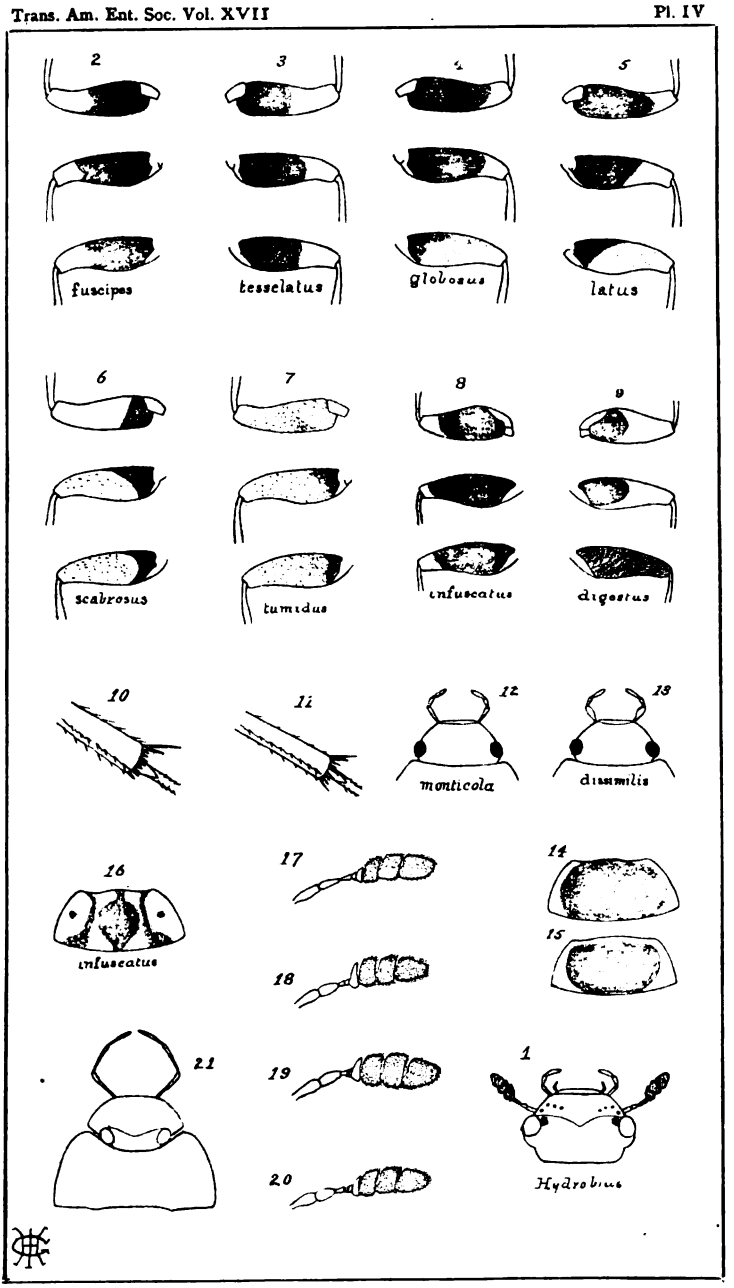

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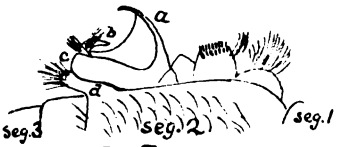
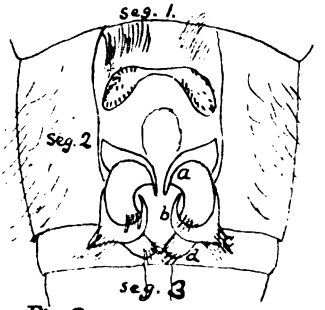


Fig. 7.

Fig. 4.



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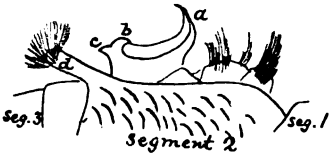

Fig. 5.

Fig. 9.

Fig. 10

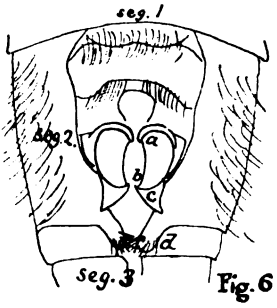

Fig. 6

Fig. 11.

Fig. 1.

Fig. 12

Fig. 13.

Fig. 2

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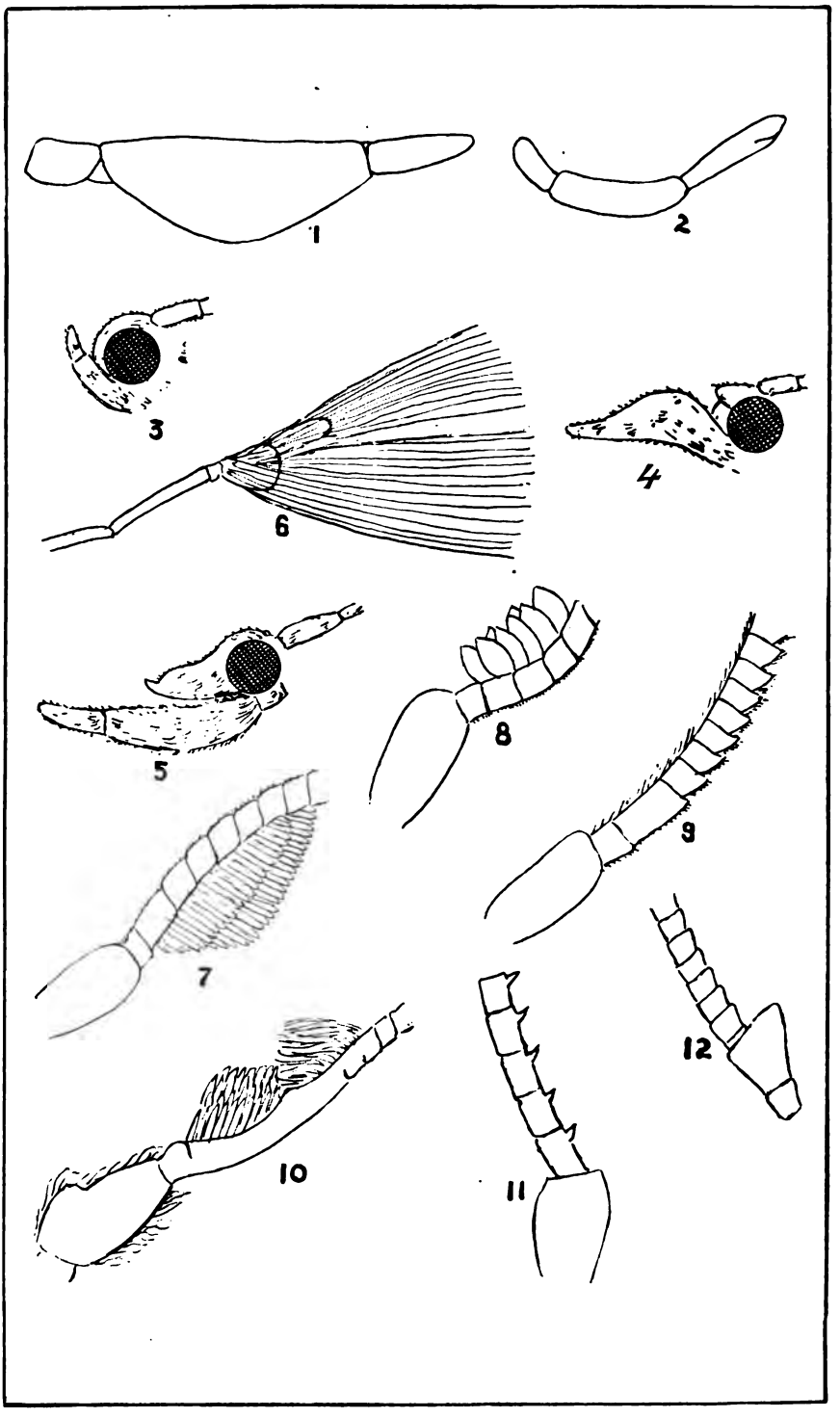

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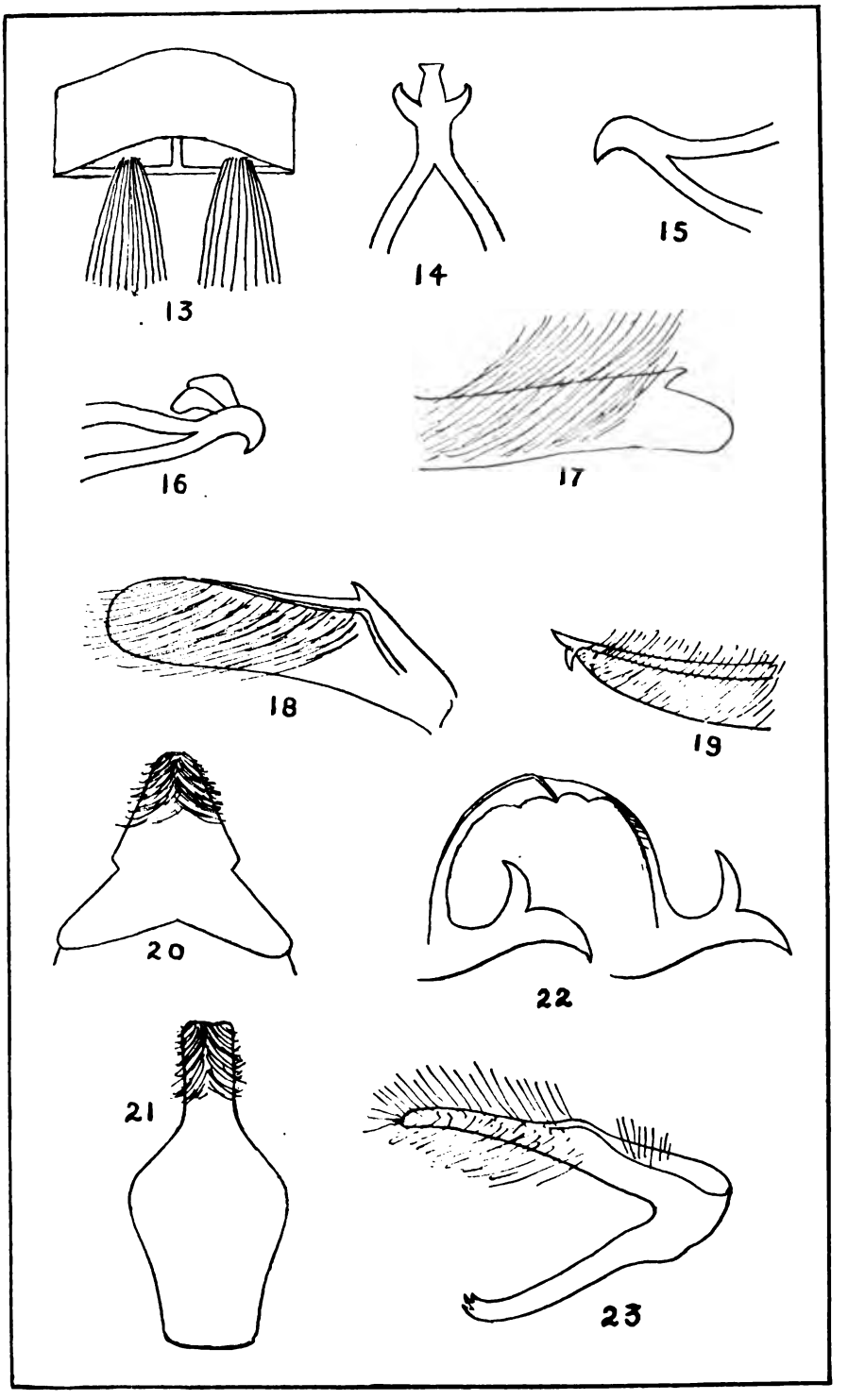

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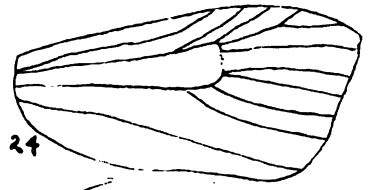

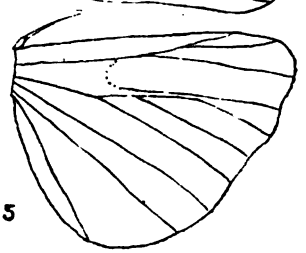

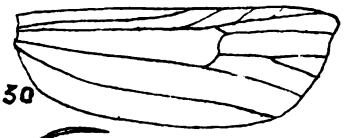

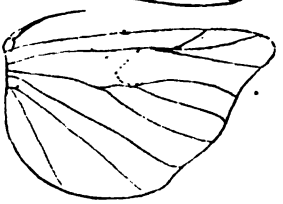

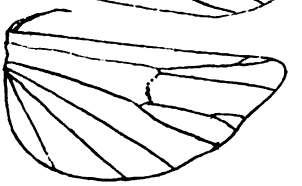

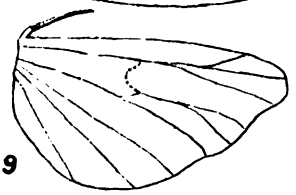

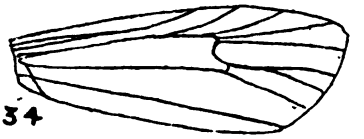

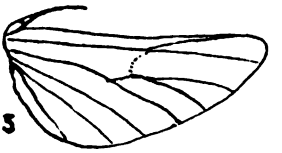

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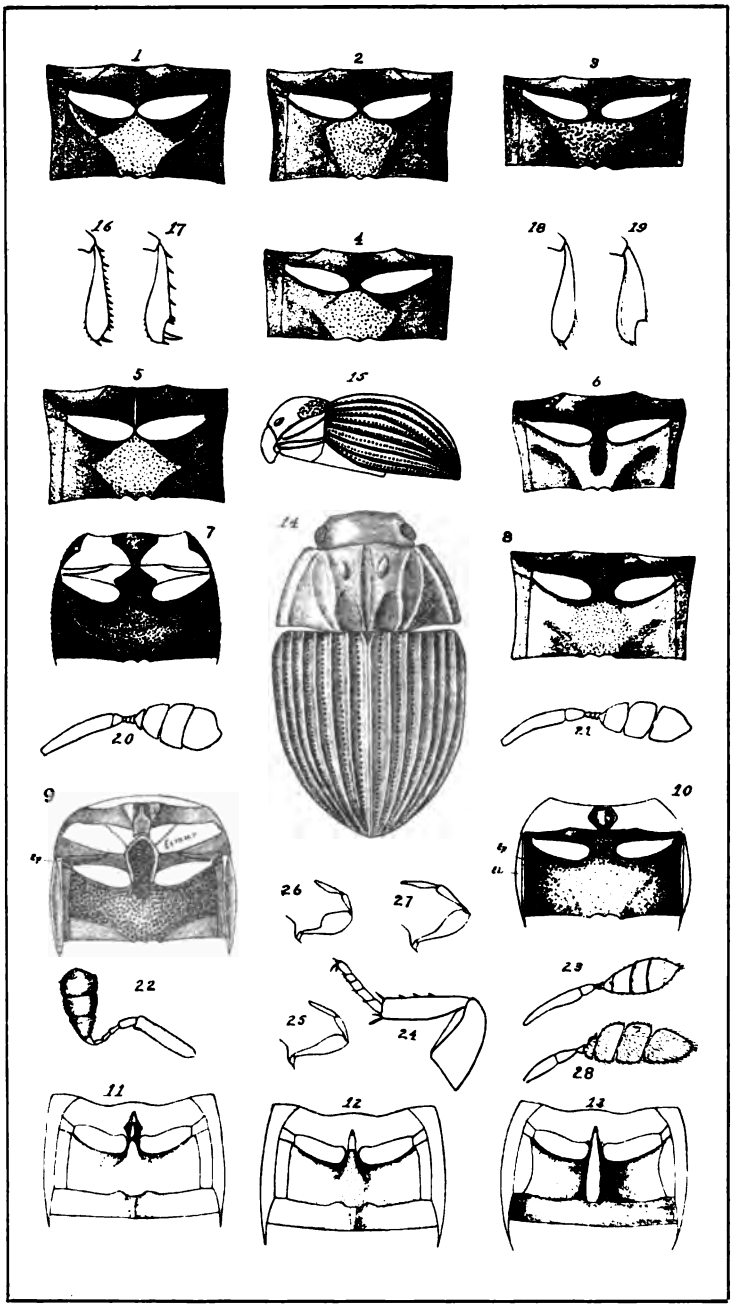

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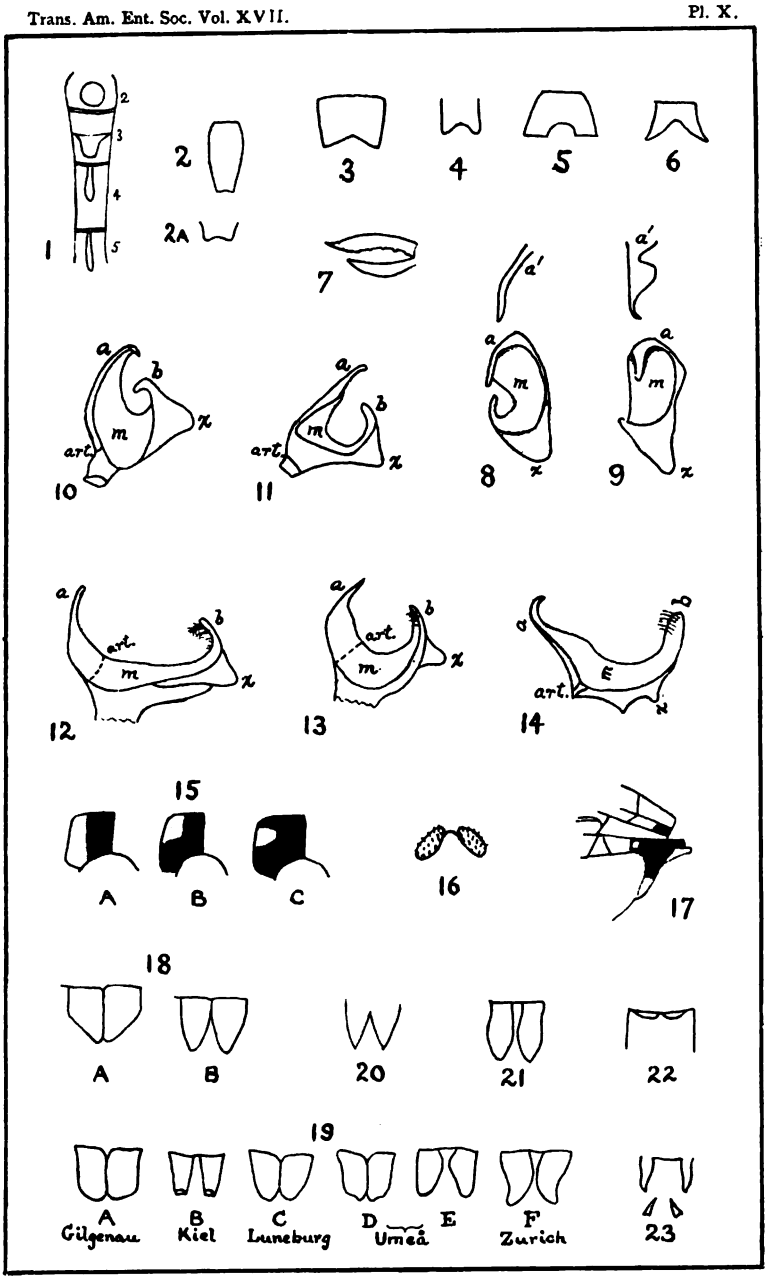

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